THE

VICTOR TURBINE.

Stilwell & Bierce Mfg. Co.

DAYTON, OHIO.

18[illegible]

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SEVERAL causes are operating to constantly enhance the value of our water powers, while at the same time the average supply of water available for manufacturing purposes is steadily diminishing. Many locations which a few years ago afforded a supply of water so abundant as to admit of very wasteful use now demand the most economical water-wheels that can be obtained; and many turbines hitherto regarded as good enough must give place to better ones.

Desiring to meet this demand for a more efficient Water Motor, we some time since announced our determination to furnish, if possible, the best Turbine that science, combined with experience, could produce. We especially desired to obtain the maximum capacity of a given diameter of wheel combined with high percentage of useful effect.

In pursuance of this determination we erected a Testing Flume at our Works, equipped it with Emerson's Dynamometer and Hook Gauge, and entered upon a long series of thorough experiments, which have resulted in the production of the **Victor Turbine,** herewith illustrated, and which has produced such astonishing and unprecedented results as to mark **a new era in turbine building.**

The remarkable power and high percentage of useful effect developed by the **Victor,** together with its simple, strong construction and **perfect gate,** present a combination of excellencies not found elsewhere, and which will, we trust, command the attention of all who desire to obtain **at the least cost the largest amount of power from a limited quantity of water.**

We propose to sell the Victor Turbine solely on its merits, at a fair price, and **subject to test, if desired,** at purchaser's expense, unless the wheel should fail to perform as guaranteed, in which event we will pay all expenses of testing.

We solicit an opportunity to confer with all parties in want of Water Wheels, and especially invite correspondence from those whose present power is inadequate to their requirements.

STILWELL & BIERCE MFG. CO., DAYTON, O.

Joel H. Fox, Agt.,
WESTFIELD, MASS.

DESCRIPTION AND MODE OF CONSTRUCTION

—OF THE—

VICTOR TURBINE.

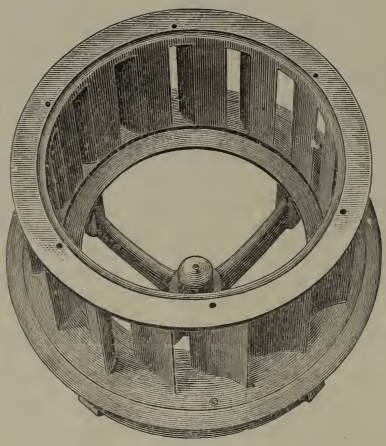

FIG. 1. OUTER CHUTE-CASE.

Without further preliminary remarks, we now pass to a description of each part of the Victor Turbine, and the manner in which it is constructed. We ask particular attention to the fact that *all the work in fitting up the Victor is performed by machinery* (*boring-mills and lathes*), **every separate part being fitted to a standard gauge.** *Hand-work or guess-work* is entirely dispensed with. Duplicate parts that *will fit* can be furnished in case of accident, and very many other advantages—which will

readily occur to the mind of any intelligent mechanic—are obtained by this process of construction which can not be obtained by those of our competitors whose wheels are so complicated as to necessitate a large amount of hand-labor in fitting up.

Figure 1 is the Outer Chute-Case and Cylinder, with the bridge-tree and wood-step which support the wheel in position. This cylinder is one casting; and, after receiving the bridge-tree and chute-case—which are secured by set-screws, as shown,—it is placed upon a horizontal boring-mill, and the chute-case is bored out to receive the register-gate (fig. 2) which revolves within it. The cylinder has a projecting flange, which rests upon the floor of the flume, and this flange is faced off true, at a right angle with the wheel-shaft, so as to insure the wheels setting plumb, provided the floor of the flume is level.

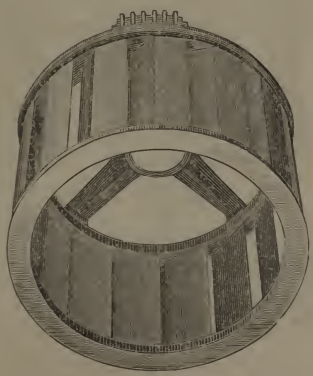

FIG. 2. REGISTER-GATE.

Figure 2 illustrates our **Improved Inside Register-Gate,** which is cast in one piece, with *fixed water-ways*

corresponding with the chutes in the outer case,—the two combined forming one duplex chute. This gate is bored out to receive the wheel, and is turned off to fit the outer case, within which it revolves, and is moved —for the purpose of admitting and shutting off the water—by means of a segment and pinion. The movement of this register-gate regulates the amount of water supplied to the wheel, and secures an equal and uniform delivery on all parts of the wheel *without changing the direction of the current or the relative angle of the stream and the face of the bucket, or in any degree checking the velocity of the water admitted to the wheel.*

Attention is called to the four-armed spider attached to the gate, as shown in figure 2, the hub of which is bored out to fit accurately upon the lower end of the pedestal, which projects beneath the top of the wheel-case and forms a journal-bearing, as shown in figure 3. We find this improvement, in its practical workings, to be of great value. It enables us to fit the gate so very close that it can not leak, and yet have it work easily; it strengthens the gate, holds it rigidly to shape, reduces

FIG. 3. TOP OF WHEEL-CASE.

the friction in moving it to its minimum, *and entirely obviates every objection hitherto urged against a register-gate.*

The great advantage of this gate—composed of one

single casting—over a complication of "butterflies," rings, rods, and bolts, will be apparent to all.

Figure 3 represents the *top* or crown-plate of the Wheel-Case, with the *pedestal* attached through which the wheel-shaft passes. *The projection of this pedestal* underneath the top, and passing through the hub of the gate-spider, forms a feature of our late patented improvements, as previously mentioned, and is so clearly shown by the artist as to be readily understood.

As will be seen, this top is composed of a single casting of great strength. It extends over the register-gate, and is fastened by set-screws to the outer chute-case. This arrangement **protects the gate** *entirely from vertical pressure of the column of water and* **renders its movement very easy.** This simple arrangement also greatly facilitates the erection of wheels, or obtaining access to them in case of accident, as by simply removing the set-screws the top becomes detached.

The Pinion and Segment by which the gate is operated are *completely housed*, so that they are protected from breakage by foreign substances getting in between the teeth. The cap of this housing may be easily detached, as shown in figure 5, by simply removing two set-screws. This thorough protection of the pinion and segment is *of great value and importance*, and constitutes one of our patented improvements.

The Pedestal, which surmounts the wheel-case, after being faced off true, is fastened to the top or crown-plate by set-screws. The seat below the follower-blocks insures a rigid upper bearing for the wheel-shaft independent of the follower-blocks; and in connection with the ar-

rangement of the bridge-tree, that holds the step for the wheel-shaft, secures perfect steadiness of motion, the minimum of friction, and the utmost strength and durability.

Attention is called to an improvement in the construction of the upper portion of the pedestal that contains the follower-blocks, which is now made, as clearly shown in figure 5, page 7, and *not* as shown in figure 3—the latter being our old form of construction. This improvement lengthens the follower-blocks but diminishes

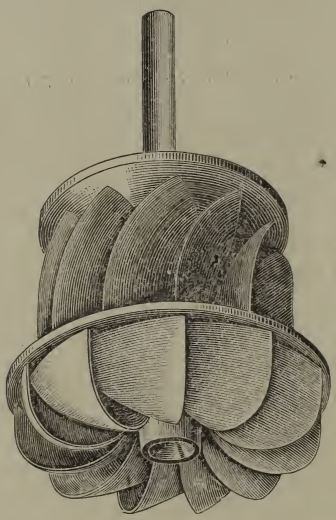

FIG. 4. VICTOR WHEEL REMOVED FROM ITS CASE.

Patented October 2, 1877.

the height of the pedestal, and admits of elevating the outer chute-case, gate, and crown-plate all together, without removing the coupling from the wheel-shaft,—

thus exposing the face of the wheel to view, by simply disconnecting the gate-rod at its coupling and removing the set-screws that fasten the chute-case to its seat in the cylinder. This arrangement greatly facilitates the erection of large wheels in the flume, and secures ready access to the wheel in case of necessity for removing obstructions.

Figure 4 shows the Victor Wheel on its shaft removed from the chute-case. As will be seen, the wheel

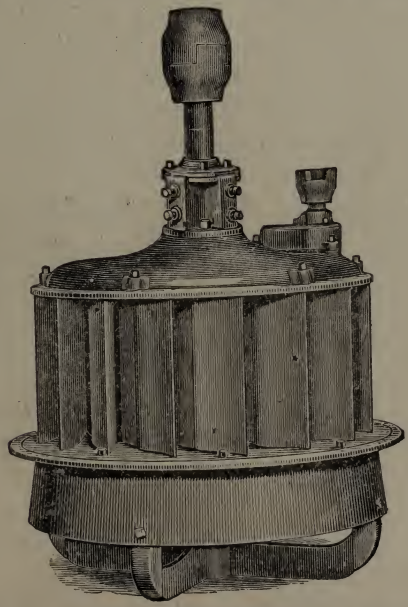

FIG. 5. VICTOR WHEEL AND CASE COMPLETE.

Patented July 30, 1872, January 19, 1875, and October 2, 1877.

is radically different from any other wheel in the market; and it presents some decidedly novel features. It

receives the water upon the outside and discharges it downward and outward, the lines of discharge occupying the entire diameter of the lower portion of the wheel, excepting only the space filled by the lower end of the shaft.

This form of construction secures the maximum capacity of a given diameter of wheel, and also great strength and durability; and the tests elsewhere reported give proof of its unparalleled power and efficiency.

Having separately described and illustrated the component parts of our Victor Turbine, we now bring these parts together, and in Fig. 5, page 7, present to our readers a *fac simile* of our celebrated wheel, as it appears when shipped to customers, ready to set in the flume.

As will be observed, the Chute-Case and Gate are substantially the same in construction and operation as those used for several years past in our "Eclipse Wheel" with such perfect satisfaction. Experience has demonstrated that there was but little room for improvement in these particulars.

We claim that in the construction of the Victor we have reduced the various parts of a portable wheel and case to the smallest possible number compatible with the greatest efficiency.

Every separate piece of our wheel and case is fitted up to a standard gauge with the greatest care,—the labor being performed with the most improved machinery.

We invite the most careful comparison of our Victor Wheel in all respects with any and all other turbines in the market; and, without wishing to boast, we challenge

competition from any source in respect to **power, simplicity, durability, strength, and accessibility** of all its parts.

POWER OF THE VICTOR.

We invite particular attention to the **extraordinary power** developed by the Victor Wheel in proportion to its diameter, being from two to three times greater than that of other turbines hitherto regarded as first-class wheels,—a fact so startling as to be almost incredible at first to many of our correspondents. This feature is of great practical importance in the application of a wheel to the propulsion of machinery, as it carries with it numerous advantages, among which we may name economy of space, quick speed (a matter of special importance under *low falls*), light gearing, less wear and tear, and loss in transmitting power. It also secures greater accuracy of construction, with better finish and proportional strength of each part.

This feature of great capacity in a small diameter of wheel particularly adapts the **Victor** for shipment over long and expensive routes, as its weight per horse-power is much less than wheels of ordinary construction.

Without desiring to institute invidious comparison, but for the purpose of making this point clear to our readers, we can not do better just here than to make an extract from Mr. Emerson's editorial in his "Turbine Reporter," Vol. III., No 4:

[From Emerson's Turbine Reporter.]

"In order to realize the capacity of the **Victor Tur-bine** it is necessary to compare it with wheels that

"were popular but a few years since, when Swain, Hous-
"ton, Leffel & Co., each claimed to construct wheels of
"greater capacity for their diameter than those of any
"other make, and in support of their claims published
"tables at least fully up to the capacity of their wheels;
"the tables of Swain and Houston being computed upon
"a supposed useful effect of 80 per cent. of the water
"used, and those of Leffel & Co. at 88 per cent., though
"no reliable test of the Leffel has ever given 80 per
"cent. Under 18 feet head, the Swain, 15¼ inch, is tabled
"to give 13½ H. P.; the Houston, 15 inch, 8½ H. P.; and
"the Leffel, 15¼ inch, 11 1-10 H. P.; while the **Victor,**
"15 inch, as may be seen by the test herewith annexed,
"under 18.34 head, actually gave 29.36 H. P., and a use-
"ful effect of .8808 per cent. The construction of the
"**Victor** is such that it may be made far more durable
"than either of the three others named, while it is
"more economical in the use of water at part-gate than
"the Houston or Leffel:

HEAD IN FEET	REVOLUTIONS PER MINUTE	HORSE POWER	CUBIC FEET OF WATER.	PERCENTAGE USEFUL EFFECT
18 30	343.5	28.62	977.11	.8473
18.34	323.	29.36	973.75	.8705
18.10	321.5	29.22	970.39	.8808

"As will be observed, the **Victor** develops remarkable
"power, and a high per cent. of useful effect, which
"facts, together with its nicely-working gate, and simple,
"strong, and durable construction, should favorably
"commend it to the attention of all discriminating pur-
"chasers."

SCIENTIFIC TESTS.

Examine the Record

MADE BY THE

VICTOR TURBINE WATER WHEEL

In the Testing Flume at Holyoke, Mass., and reported below.

Various sizes of the **Victor Turbine** have been subjected to a series of tests in the Holyoke Testing Flume, by competent and disinterested engineers, for the purpose of correctly determining its power and efficiency, and the results developed—as published herewith—are the **BEST ON RECORD.** This testing flume is provided with all the most improved appliances for making such tests, and is open to all on the same terms. All of the wheels of any considerable reputation have been tested, and the results produced are on record, so that parties desiring to investigate the actual efficiency of the respective Turbines can do so:

	Head in feet	Revolutions per minute	Horse Power	Cubic Feet of Water	Percentage Useful Effect.
15 inch Victor...	18.34	323.	29.36	973.75	.8705
	18.10	321.5	29.22	970 39	.8808
15 inch Victor...	18 06	368.	30.17	990 19	.8932
	18.08	355.	30.12	996 83	.8849
20 inch Victor...	18 22	286.	48.75	1660 17	.8532
	18.23	275.	48.75	1660 17	.8528
	18 21	269 5	49.00	1671 57	8722
25 inch Victor...	17.79	205 5	67 72	2362.72	.8530
	17 96	209.	68.62	2356 54	.8584
	17.80	212 5	67.61	2356.	.8533
30 inch Victor...	11 65	144.5	52.54	2751.87	.8676
	11 66	147 5	51.96	2755 09	.8564
	11 70	152.	52.02	2738.	8614
35 inch Victor...	17 13	147.5	134.09	4994.	.8289
	17 10	150.	134.09	4981.	.8334
15 inch Victor...	18.01	345.	27.00	923 40	.8595
	17 98	342.	26.76	920.40	.8564
	17 97	348.	26.71	920	.8551
17½ inch Victor.	18 02	280.	35.51	1164 60	.8960
	17 96	292.	36.35	1197.	.8950
	17 96	284 6	35.84	1202.4	.8790
35 inch Victor...	17.31	151.7	135.68	4895	.8489
	17 29	160.	133 19	4806.	.8497
	17.32	147.	136.08	4905.	.8491

Proportionately high results were obtained on all sizes at partial gate.

All of the above were plain cast-iron wheels, tested for purchasers. The last three were tested by Clemens Herschel, Hydraulic Engineer, Holyoke Water Power Co. In comparing the above results with those produced by other styles of wheels in the same Testing Flume, select for such comparison wheels of *similar capacity*, regardless of their diameter.

We need not enlarge upon the above remarkable results. We believe they are unprecedented among recorded reliable tests of Turbines, and we feel sure will cammand the attention of all who desire to obtain **at the least cost the largest amount of power from a limited quantity of water.**

While high economy in the use of water is of great importance, it will not compensate for serious defects in other respects. A wheel may yield a high percentage of power, and yet lack durability; or it may wear down its step so rapidly, or have such a bad-working gate, as to condemn it for practical use.

The conditions under which the great majority of turbines are operated are such as to make great strength and simplicity in all the details of construction of the utmost importance, and indispensable to long-continued service. In all these respects the Victor will bear close inspection and comparison with all other turbines.

COMPACTNESS, SIMPLICITY, STRENGTH, AND ACCESSIBILITY OF ALL ITS PARTS, ARE PRE-EMINENT FEATURES IN THE CONSTRUCTION OF THE VICTOR TURBINE.

CONDITIONS OF WARRANTY.

Our published tables of power, speed, etc., which occupy the following six pages, may be relied upon as substantially correct; but in order to more effectually protect the interests of the purchaser, we will, if desired, specify in the contract what amount of power the wheel shall produce under any given head with a stated quantity of water, and forward the wheel for test to the Holyoke Testing Flume. Should said test develop guaranteed results, the purchaser shall accept the wheel and pay for the same, including all expenses of testing. Should the wheel fail to develop guaranteed results, the purchaser shall be at no expense for testing nor under any obligations to accept the wheel. Such a test is the only means of accurately determining the efficiency of a wheel; but we are willing to subject our wheel to a practical test in the propulsion of machinery, if that plan is preferred by the purchaser, on the following conditions:

Our wheels must be set and flumes constructed according to our instructions; and should they fail to perform as represented by us, we will, upon receipt of such notice, give them prompt attention.

Should their failure to perform as represented arise from any neglect or mistake upon our part, we will make such alterations as such neglect or mistake may necessitate, **without expense to the purchaser.** But should such failure in the performance of the wheel or wheels be in consequence of the purchaser not having the flumes, wheel-pit, and water-courses properly made, or the wheels not being set and geared according to our direction, then, in all such cases, **the purchaser of the wheels shall bear all expenses** connected with making such alterations as may be required.

No trouble will occur if our instructions are followed.

STILWELL & BIERCE MFG. CO.,

DAYTON, OHIO.

The following Table was calculated expressly for the VICTOR TURBINE WATER-WHEEL, from data obtained by actual experiments. It contains the size of the different wheels in inches of diameter, the number of horse power, the cubic feet of water used per minute, and the number of revolutions made per minute by each sized wheel when at work, for any head from 3 to 12 feet.
This Table supersedes all previous similar publications.

Diam'r Wheel in Inches.	Horse Power, Cubic Feet Discharged, Revolutions Per Minute	HEAD IN FEET.									
		3	4	5	6	7	8	9	10	11	12
6	H'se Pow'r	0.33	0.51	0.71	0.91	1.15	1.42	1.70	2.00	2.30	2.65
	Cubic Feet	69	79	89	98	106	113	120	127	133	139
	Revolut'ns	350	400	445	490	530	570	605	638	660	691
8	H'se Pow'r	0.47	0.78	1.13	1.48	1.85	2.28	2.71	3.13	3.67	4.21
	Cubic Feet	98	121	142	156	168	180	190	200	210	219
	Revolut'ns	267	308	345	377	407	435	463	487	512	533
10	H'se Pow'r	0.92	1.43	1.96	2.61	3.25	3.97	4.72	5.58	6.42	7.30
	Cubic Feet	196	220	246	270	291	311	330	348	364	381
	Revolut'ns	212	243	272	299	324	346	366	383	403	424
12	H'se Pow'r	1.40	2.17	3.02	3.97	5.00	6.10	7.28	8.54	9.83	11.20
	Cubic Feet	291	335	375	412	444	475	503	532	557	582
	Revolut'ns	171	197	221	242	261	279	296	311	327	342
15	H'se Pow'r	2.00	3.10	4.33	5.70	7.18	8.78	10.46	12.28	14.15	16.13
	Cubic Feet	418	483	541	593	640	684	726	765	803	838
	Revolut'ns	142	164	183	200	217	232	246	259	272	284
17½	H'se Pow'r	2.67	4.15	5.75	7.60	9.55	11.65	13.90	16.25	18.78	21.40
	Cubic Feet	555	641	717	785	848	907	962	1015	1064	1111
	Revolut'ns	121	140	155	171	184	198	210	221	232	242
20	H'se Pow'r	3.30	5.12	7.13	9.38	11.80	14.43	17.22	20.17	23.27	26.50
	Cubic Feet	689	796	889	975	1053	1125	1194	1257	1318	1377
	Revolut'ns	105	122	136	149	161	173	183	193	203	212
25	H'se Pow'r	5.00	7.70	10.78	14.18	17.87	21.80	26.03	30.56	35.23	40.10
	Cubic Feet	1043	1205	1346	1476	1593	1703	1806	1904	1997	2086
	Revolut'ns	83	95	107	118	129	138	146	154	161	168
30	H'se Pow'r	6.90	10.65	14.89	19.60	24.70	30.10	36.00	42.11	48.65	55.35
	Cubic Feet	1436	1660	1855	2034	2196	2346	2488	2623	2752	2873
	Revolut'ns	71	82	91	100	107	115	122	129	135	141
35	H'se Pow'r	10.45	16.04	22.35	29.52	37.15	45.38	54.20	63.50	73.25	83.45
	Cubic Feet	2219	2562	2863	3139	3390	3623	3844	4051	4249	4438
	Revolut'ns	60	70	78	85	92	99	106	111	116	121
40	H'se Pow'r	12.45	19.23	26.85	35.35	44.52	54.40	64.90	76.04	86.70	99.90
	Cubic Feet	2657	3069	3428	3758	4059	4337	4602	4851	5088	5314
	Revolut'ns	52	60	68	74	80	86	92	96	100	105
44	H'se Pow'r	14.16	21.82	30.46	40.07	50.50	61.70	73.60	86.22	99.50	113.36
	Cubic Feet	3014	3408	3887	4262	4603	4920	5219	5502	5770	6029
	Revolut'ns	48	54	60	66	72	78	83	88	92	95
48	H'se Pow'r	16.68	25.67	35.92	47.30	59.60	72.75	86.82	101.79	117.39	133.73
	Cubic Feet	3552	4102	4583	5025	5426	5800	6153	6485	6802	7105
	Revolut'ns	44	49	55	61	67	72	76	80	84	88
55	H'se Po'r	20.24	31.16	43.55	57.22	72.16	88.16	105.16	123.28	142.14	161.93
	Cubic Ft..	4300	4970	5557	6085	6576	7030	7454	7864	8243	8618
	Revolu'ns	38	44	50	54	59	63	67	70	74	77

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This Table supersedes all previous similar publications.

Diam'r Wheel in Inches.	Horse Power, Cubic Feet Discharged, Revolutions Per Minute.	HEAD IN FEET.									
		13	14	15	16	17	18	19	20	21	22
6	H'se Pow'r	3.00	3.35	3.75	4.05	4.40	4.80	5.20	5.72	6.15	6.65
	Cubic Feet	144	150	155	160	164	169	174	179	184	188
	Revolut'ns	725	755	785	814	842	867	890	910	935	959
8	H'se Pow'r	4.75	5.25	5.78	6.39	7.00	7.66	8.25	8.92	9.60	10.28
	Cubic Feet	228	234	240	248	254	264	271	278	285	292
	Revolut'ns	555	576	598	616	636	652	670	687	703	718
10	H'se Pow'r	8.25	9.20	10.25	11.18	12.27	13.35	14.50	15.79	16.80	18.05
	Cubic Feet	397	412	426	441	454	468	480	492	504	517
	Revolut'ns	441	457	474	488	503	519	533	550	562	574
12	H'se Pow'r	12.64	14.11	15.67	17.65	18.93	20.58	22.85	24.11	25.94	27.81
	Cubic Feet	610	629	651	672	693	713	732	751	770	788
	Revolut'ns	356	369	382	395	407	419	430	441	452	463
15	H'se Pow'r	18.19	20.33	22.55	24.80	27.20	29.64	32.14	34.70	37.30	40.00
	Cubic Feet	873	905	937	968	997	1026	1055	1081	1107	1135
	Revolut'ns	295	306	317	327	338	348	358	367	375	384
17½	H'se Pow'r	24.10	27.00	29.89	32.90	36.00	39.25	42.55	46.00	49.40	52.90
	Cubic Feet	1157	1199	12.41	1281	1320	1359	1396	1432	1467	1501
	Revolut'ns	253	262	271	280	289	297	305	313	321	328
20	H'se Pow'r	29.90	53.41	37.08	40.82	44.70	48.70	52.83	57.10	61.39	65.80
	Cubic Feet	1433	1497	1540	1591	1639	1688	1734	1778	1822	1865
	Revolut'ns	220	228	236	244	252	259	266	273	280	286
25	H'se Pow'r	45.30	50.62	56.08	61.86	67.68	73.70	80.00	86.47	92.90	99.68
	Cubic Feet	2171	2252	2329	2408	2483	2556	2624	2693	2759	2824
	Revolut'ns	175	181	187	193	200	207	213	219	225	231
30	H'se Pow'r	62.40	69.75	77.35	85.25	93.30	101.65	110.30	119.12	128.10	137.40
	Cubic Feet	2991	3104	3212	3318	3420	3520	3616	3710	3801	3890
	Revolut'ns	147	153	159	164	169	174	179	183	187	191
35	H'se Pow'r	93.88	105.16	116.59	128.43	140.70	154.25	166.25	179.65	193.14	207.00
	Cubic Feet	4619	4794	4961	5125	5283	5436	5585	5730	5870	6008
	Revolut'ns	126	131	136	140	145	149	153	157	160	163
40	H'se Pow'r	112.50	126.00	139.70	154.00	168.55	183.60	199.10	215.14	231.35	248.00
	Cubic Feet	5532	5740	5941	6132	6326	6511	6686	6861	7030	7193
	Revolut'ns	109	113	116	119	122	125	129	132	135	138
44	H'se Pow'r	127.90	142.87	158.42	174.55	191.16	208.30	225.85	244.05	262.60	281.43
	Cubic Feet	6274	6510	6737	6958	7174	7383	7584	7784	7971	8159
	Revolut'ns	99	103	107	111	114	117	121	124	127	130
48	H'se Pow'r	150.82	168.60	186.80	205.90	225.52	245.70	266.65	287.63	309.46	331.94
	Cubic Feet	7397	7676	7944	8205	8457	8703	8941	9174	9400	9619
	Revolut'ns	92	96	99	102	105	108	111	114	116	119
55	H'se Po'r	182.70	203.90	226.38	251.98	273.00	297.67	322.87	348.49	374.97	401.82
	Cubic Ft..	8965	9292	9627	9939	10244	10549	10840	11115	11390	11651
	Revolu'ns	80	83	86	89	92	94	97	99	102	104

The following Table was calculated expressly for the VICTOR TURBINE WATER-WHEEL, from data obtained by actual experiments. It contains the size of the different wheels in inches of diameter, the number of horse power, the cubic feet of water used per minute, and the number of revolutions made per minute by each sized wheel when at work, for any head from 23 to 31 feet.
This Table supersedes all previous similar publications.

Diam'tr Wheel in Inches.	Horse Power, Cubic Feet Discharged, Revolutions Per Minute.	HEAD IN FEET.								
		23	24	25	26	27	28	29	30	31
6	Horse Power.....	7.10	7.57	8.05	8.54	9.05	9.56	10.06	10.56	11.10
	Cubic Feet.....	192	196	200	204	209	213	217	220	224
	Revolutions.....	979	997	1018	1038	1058	1077	1095	1113	1132
8	Horse Power.....	11.00	11.74	12.46	13.22	14.00	14.80	15.60	16.42	17.22
	Cubic Feet.....	299	305	311	317	323	329	336	341	347
	Revolutions.....	733	748	764	779	794	809	824	839	854
10	Horse Power.....	19.30	20.55	21.86	23.15	24.50	25.92	27.30	29.09	30.18
	Cubic Feet.....	528	539	550	561	572	583	593	604	613
	Revolutions.....	586	598	611	623	635	647	658	670	682
12	Horse Power.....	29.74	31.70	33.70	35.73	37.82	39.94	42.10	44.31	46.52
	Cubic Feet.....	805	823	840	856	873	889	904	920	935
	Revolutions.....	474	484	494	504	513	522	531	540	550
15	Horse Power.....	42.80	45.64	48.50	51.47	54.46	57.50	60.60	63.76	67.00
	Cubic Feet.....	1160	1184	1210	1234	1257	1280	1302	1324	1347
	Revolutions.....	393	401	410	418	426	433	441	448	455
17½	Horse Power.....	56.70	60.40	64.25	68.10	72.00	76.15	80.25	84.52	88.65
	Cubic Feet.....	1535	1568	1602	1634	1665	1696	1725	1755	1784
	Revolutions.....	336	343	350	357	364	370	377	384	390
20	Horse Power.....	70.35	75.00	79.75	84.56	89.42	94.50	99.60	104.90	110.00
	Cubic Feet.....	1906	1947	1988	2027	2065	2104	2141	2178	2213
	Revolutions.....	292	298	305	311	317	323	329	335	341
25	Horse Power.....	106.50	113.60	120.75	128.09	135.50	143.14	150.86	158.84	166.75
	Cubic Feet.....	2888	2950	3012	3071	3130	3187	3243	3298	3353
	Revolutions.....	237	242	247	252	256	261	266	270	275
30	Horse Power.....	146.80	156.60	166.40	176.50	186.80	197.30	207.87	218.86	229.70
	Cubic Feet.....	3978	4064	4148	4230	4311	4390	4467	4544	4619
	Revolutions.....	196	200	204	208	212	216	220	224	228
35	Horse Power	221.39	235.90	250.40	266.00	281.60	297.38	313.50	330.00	346.45
	Cubic Feet.....	6144	6276	6406	6532	6656	6779	6900	7018	7132
	Revolutions.....	167	170	174	178	182	185	188	191	194
40	Horse Power.....	265.20	282.70	300.50	318.75	337.30	356.20	375.50	395.10	415.00
	Cubic Feet.....	7358	7515	7670	7821	7970	8117	8261	8403	8541
	Revolutions.....	141	144	147	150	153	156	159	162	165
44	Horse Power.....	300.85	320.70	340.90	361.54	382.60	404.15	426.00	448.20	470.75
	Cubic Feet.....	8343	8522	8698	8869	9038	9206	9368	9532	9685
	Revolutions.....	133	135	137	140	143	146	149	152	155
48	Horse Power.....	354.92	378.36	402.25	426.60	451.45	476.80	502.55	528.43	555.35
	Cubic Feet.....	9836	10049	10257	10458	10658	10854	11045	11236	11419
	Revolutions.....	121	124	126	129	132	135	137	139	142
55	Horse Power.....	429.72	457.92	487.23	516.70	546.66	577.35	608.15	640.32	672.50
	Cubic Feet.....	11918	12171	12432	12677	12915	13153	13377	13615	13838
	Revolutions.....	107	109	111	113	115	118	120	122	124

The following Table was calculated expressly for the VICTOR TURBINE WATER-WHEEL, from data obtained by actual experiments. It contains the size of the different wheels in inches of diameter, the number of horse-power, the cubic feet of water used per minute, and the number of revolutions made per minute by each sized wheel when at work, for any head from 32 to 40 feet.
This Table supersedes all previous similar publications.

Diam'tr Wheel in Inches.	Horse Power, Cubic Feet Discharged, Revolutions Per Minute.	HEAD IN FEET. 32	33	34	35	36	37	38	39	40
6	Horse Power	11.68	12.24	12.80	13.38	13.98	14.53	15.10	15.65	16.18
	Cubic Feet	228	232	235	238	241	244	247	250	252
	Revolutions	1151	1170	1188	1204	1220	1237	1254	1271	1287
8	Horse Power	18.06	18.90	19.80	20.70	21.57	22.45	23.40	24.30	25.24
	Cubic Feet	352	357	363	368	373	377	383	389	393
	Revolutions	869	881	893	905	917	929	942	954	966
10	Horse Power	31.69	33.06	34.70	36.25	37.77	39.30	41.00	42.50	44.70
	Cubic Feet	622	632	641	651	660	669	679	688	696
	Revolutions	691	701	712	724	735	745	754	763	772
12	Horse Power	48.80	51.10	53.45	55.80	58.25	60.65	63.16	65.65	68.13
	Cubic Feet	949	965	979	991	1007	1021	1034	1048	1061
	Revolutions	559	568	576	584	592	600	608	616	624
15	Horse Power	70.25	73.56	76.90	80.40	83.75	87.30	90.90	94.60	98.25
	Cubic Feet	1369	1389	1411	1431	1451	1472	1492	1511	1530
	Revolutions	464	471	478	485	491	498	505	512	518
17½	Horse Power	93.00	97.40	101.75	106.40	110.90	115.50	120.15	125.00	130.00
	Cubic Feet	1813	1842	1869	1896	1922	1949	1975	2000	2025
	Revolutions	396	402	408	414	420	426	432	438	443
20	Horse Power	115.45	120.90	126.45	132.00	137.75	143.50	149.40	155.40	161.50
	Cubic Feet	2249	2284	2319	2352	2386	2419	2451	2483	2515
	Revolutions	346	351	356	361	366	371	376	381	386
25	Horse Power	175.08	183.20	191.60	200.00	208.66	217.47	226.30	235.40	244.40
	Cubic Feet	3406	3459	3511	3563	3614	3663	3713	3765	3813
	Revolutions	279	283	288	292	296	300	304	308	312
30	Horse Power	241.00	252.30	264.00	275.65	287.50	299.50	311.80	324.20	336.70
	Cubic Feet	4694	4766	4838	4908	4977	5044	5113	5180	5245
	Revolutions	232	236	240	243	246	249	252	255	258
35	Horse Power	362.25	379.60	398.00	415.68	433.57	451.53	470.25	489.00	508.10
	Cubic Feet	7248	7360	7471	7580	7687	7793	7898	8002	8103
	Revolutions	198	201	204	207	210	213	216	219	221
40	Horse Power	435.25	455.80	476.75	498.00	519.35	541.15	563.25	585.70	608.25
	Cubic Feet	8678	8812	8945	9076	9204	9320	9456	9580	9700
	Revolutions	168	171	174	177	180	183	186	189	192
44	Horse Power	493.75	517.00	540.80	564.80	589.10	613.80	638.90	664.30	690.00
	Cubic Feet	9841	10003	10146	10293	10438	10583	10726	10868	11000
	Revolutions	157	160	162	164	166	168	170	173	175
48	Horse Power	582.50	610.00	638.00	666.30	695.00	724.15	753.81	783.84	814.00
	Cubic Feet	11605	11783	11963	12136	12308	12476	12645	12811	12980
	Revolutions	144	146	148	150	152	154	156	158	160
55	Horse Power	705.38	738.96	772.50	806.62	841.87	877.32	913.00	949.32	985.76
	Cubic Feet	14061	14284	14493	14701	14917	15125	15326	15527	15720
	Revolutions	126	128	130	132	134	135	137	139	140

The Victor Turbine.

Table for Small Wheels under heads from 41 to 80 feet.

6 in. Wheel, Using 12 in. water.				8 in. Wheel, Using 19 in. water.				10 in. Wheel, Using 33 in. water.				12 in. Wheel, Using 50 in. water.			
Head in Feet.	Horse Power.	Cubic ft. disch'd per minute.	Revolutions per minute.	Head in Feet.	Horse Power.	Cubic ft. disch'd per minute.	Revolutions per minute.	Head in Feet.	Horse Power.	Cubic ft. disch'd per minute.	Revolutions per minute.	Head in Feet.	Horse Power.	Cubic ft. disch'd per minute.	Revolutions per minute.
41	16.97	256	1303	41	26.20	398	978	41	46.50	705	783	41	70.45	1075	632
42	17.50	260	1319	42	27.17	403	991	42	48.10	714	794	42	73.05	1089	640
43	18.15	263	1334	43	28.14	408	1003	43	49.80	723	806	43	75.60	1102	648
44	18.85	266	1351	44	29.13	412	1015	44	51.55	731	816	44	78.30	1115	657
45	19.50	270	1367	45	30.15	416	1027	45	53.30	739	825	45	81.00	1128	665
46	20.13	273	1382	46	31.15	421	1039	46	55.10	746	835	46	83.65	1141	673
47	20.83	276	1397	47	32.17	425	1051	47	56.90	753	844	47	86.40	1153	681
48	21.50	279	1412	48	33.20	430	1063	48	58.75	762	854	48	89.15	1165	689
49	22.20	282	1426	49	34.25	435	1075	49	60.60	770	865	49	91.93	1177	696
50	22.80	284	1440	50	35.30	439	1087	50	62.50	778	876	50	94.80	1189	704
51	23.50	287	1454	51	36.33	443	1100	51	64.40	786	885	51	97.60	1200	711
52	24.20	290	1468	52	37.40	447	1113	52	66.22	794	894	52	100.55	1213	719
53	24.90	293	1482	53	38.50	451	1125	53	68.15	802	903	53	103.45	1225	726
54	25.60	295	1496	54	39.65	455	1137	54	70.10	810	912	54	106.35	1237	734
55	26.35	298	1505	55	40.75	459	1150	55	72.00	817	920	55	109.30	1248	741
56	27.05	301	1513	56	41.85	463	1162	56	74.00	824	928	56	112.30	1260	748
57	27.80	304	1530	57	42.93	467	1174	57	76.00	831	936	57	115.40	1271	755
58	28.55	306	1544	58	44.00	472	1186	58	78.00	839	944	58	118.50	1282	763
59	29.25	309	1558	59	45.15	476	1198	59	80.05	846	952	59	121.60	1293	770
60	30.00	311	1577	60	46.22	480	1210	60	82.10	854	960	60	124.65	1305	777
61	30.80	313	1589	61	47.50	484	1222	61	84.15	862	967	61	127.75	1316	784
62	31.55	316	1602	62	48.69	488	1234	62	86.20	869	974	62	130.90	1326	791
63	32.35	319	1614	63	49.85	492	1245	63	88.30	874	981	63	134.00	1335	798
64	33.15	322	1628	64	51.00	496	1257	64	90.43	881	988	64	137.50	1345	806
65	33.92	324	1641	65	52.30	500	1268	65	92.60	888	996	65	140.65	1356	813
66	34.60	327	1654	66	53.50	504	1280	66	94.70	894	1004	66	143.80	1366	820
67	35.40	330	1668	67	54.72	508	1291	67	96.85	900	1011	67	147.00	1377	827
68	36.20	333	1680	68	55.50	512	1302	68	99.00	907	1018	68	150.35	1387	834
69	37.00	336	1691	69	57.17	516	1314	69	101.20	914	1025	69	153.70	1397	841
70	37.83	339	1703	70	58.37	519	1325	70	103.45	921	1032	70	157.00	1407	848
71	38.65	341	1714	71	59.10	523	1336	71	105.65	929	1038	71	160.40	1416	855
72	39.50	343	1726	72	61.00	526	1346	72	107.93	935	1044	72	163.80	1426	862
73	40.30	345	1738	73	62.30	530	1357	73	110.20	941	1050	73	167.20	1436	868
74	41.05	347	1751	74	63.53	534	1368	74	112.45	948	1057	74	170.65	1446	874
75	41.90	348	1764	75	64.85	537	1380	75	114.70	954	1064	75	174.20	1455	880
76	42.75	350	1778	76	66.10	540	1392	76	117.00	961	1070	76	177.80	1465	886
77	43.60	353	1790	77	67.43	544	1402	77	119.35	967	1077	77	181.15	1475	890
78	44.50	355	1800	78	68.76	547	1413	78	121.70	973	1084	78	184.75	1485	895
79	45.35	357	1810	79	70.00	550	1425	79	124.00	979	1090	79	188.00	1494	900
80	46.20	359	1821	80	71.45	554	1436	80	126.40	985	1096	80	192.00	1503	905

The Victor Turbine.

Table for Small Wheels under heads from 41 to 80 feet.

15 in. Wheel, Using 73 in. water.				17½ in. Wheel, Using 96 in. water.				20 in. Wheel, Using 119 in. water.				25 in. Wheel, Using 180 in. water.			
Head in Feet.	Horse Power.	Cubic ft. disch'd per minute.	Revolutions per minute.	Head in Feet.	Horse Power.	Cubic ft. disch'd per minute.	Revolutions per minute.	Head in Feet.	Horse Power.	Cubic ft. disch'd per minute.	Revolutions per minute.	Head in Feet.	Horse Power.	Cubic ft. disch'd per minute.	Revolutions per minute.
41	101.89	1545	525	41	134.70	2046	448	41	167.38	2547	391	41	253.54	3855	316
42	105.65	1563	531	42	139.65	2070	454	42	173.65	2578	396	42	262.90	3902	319
43	109.44	1580	537	43	144.65	2095	460	43	179.86	2608	401	43	272.40	3944	322
44	113.40	1601	543	44	149.75	2119	466	44	186.15	2638	405	44	282.00	3986	325
45	117.45	1621	550	45	155.00	2143	471	45	192.55	2667	409	45	291.65	4035	328
46	121.20	1639	557	46	160.10	2167	476	46	199.00	2696	413	46	301.40	4084	331
47	125.00	1657	563	47	165.25	2191	482	47	205.55	2727	418	47	311.30	4128	334
48	129.00	1674	569	48	170.50	2215	487	48	212.15	2756	422	48	321.30	4172	337
49	133.10	1691	576	49	175.90	2238	492	49	218.80	2784	426	49	331.40	4215	340
50	137.20	1709	582	50	181.35	2260	498	50	225.50	2812	430	50	341.50	4257	344
51	141.36	1726	588	51	186.85	2283	503	51	232.30	2840	434	51	351.90	4300	347
52	145.50	1743	594	52	192.35	2305	508	52	239.20	2868	438	52	362.30	4342	350
53	149.75	1759	600	53	198.00	2327	514	53	246.15	2896	442	53	372.80	4383	353
54	154.00	1776	606	54	203.55	2349	519	54	253.10	2923	445	54	383.35	4424	356
55	158.28	1792	612	55	209.15	2371	525	55	260.20	2950	449	55	394.05	4465	359
56	162.63	1809	618	56	214.90	2393	530	56	267.30	2977	453	56	404.80	4505	362
57	167.00	1826	624	57	220.70	2414	536	57	274.55	3002	457	57	415.70	4546	365
58	171.40	1842	630	58	226.60	2435	541	58	281.80	3029	460	58	426.75	4585	368
59	175.90	1857	636	59	232.50	2456	547	59	289.10	3055	464	59	438.30	4625	370
60	180.40	1873	641	60	238.45	2476	552	60	296.50	3080	468	60	450.00	4664	373
61	185.10	1888	646	61	244.40	2497	558	61	304.00	3106	472	61	461.00	4702	376
62	189.50	1903	651	62	250.45	2517	563	62	311.40	3132	476	62	472.00	4740	379
63	194.10	1918	656	63	256.50	2537	568	63	319.00	3157	480	63	483.30	4776	382
64	198.50	1933	662	64	262.55	2557	573	64	326.60	3182	483	64	494.65	4816	385
65	203.15	1948	667	65	268.70	2578	578	65	334.30	3206	487	65	506.25	4854	388
66	208.00	1963	672	66	275.00	2597	583	66	342.10	3231	490	66	518.00	4891	391
67	212.84	1978	678	67	281.20	2617	588	67	349.85	3255	494	67	529.90	4928	394
68	217.00	1993	683	68	287.40	2636	592	68	357.75	3280	497	68	541.80	4964	397
69	222.46	2009	689	69	293.80	2656	596	69	365.65	3304	501	69	553.80	5001	400
70	227.00	2026	694	70	300.30	2676	600	70	373.65	3327	504	70	565.90	5038	403
71	231.66	2039	700	71	306.80	2696	605	71	381.65	3350	508	71	578.10	5074	406
72	236.85	2051	706	72	313.30	2715	609	72	389.75	3374	511	72	590.30	5109	409
73	242.10	2064	711	73	319.90	2734	614	73	397.90	3398	515	73	602.65	5145	412
74	247.00	2077	717	74	326.50	2751	618	74	406.00	3422	518	74	615.00	5180	415
75	252.10	2092	722	75	333.20	2768	622	75	414.35	3445	522	75	627.50	5214	418
76	257.15	2107	728	76	339.90	2786	626	76	422.65	3468	525	76	640.15	5248	421
77	262.26	2121	733	77	346.60	2805	630	77	431.00	3490	529	77	652.85	5283	424
78	267.40	2134	738	78	353.45	2823	634	78	439.50	3513	532	78	665.60	5317	427
79	272.50	2148	743	79	360.20	2842	638	79	448.00	3538	536	79	678.50	5351	430
80	277.75	2161	748	80	367.00	2860	642	80	456.50	3560	540	80	691.45	5385	433

TABLE OF DIMENSIONS OF THE "VICTOR TURBINE."

The lettered columns in table correspond with the dotted lines in plate on opposite page.

SIZE OF WHEEL.	A — Diameter of Cylinder passing through floor of flume.	B — Diameter of entire wheel case.	C — Internal diameter of flume.	D — Length of shaft from flange resting on floor of flume to center of coupling.	E — Diameter of bore of upper half of coupling.	F — Length of Cylinder passing through floor of flume.	K — Depth of Pit from end of cylinder to bottom of wheel-pit.	Approximate weight of wheel complete.
6 in.	$9\frac{3}{4}$ in.	$12\frac{3}{4}$ in.	2 ft.	15 in.	$\frac{15}{16}$ in.	$2\frac{1}{8}$ in.		
8 "	$13\frac{1}{2}$ "	16 "	$2\frac{1}{2}$ "	18 "	$1\frac{3}{16}$ "	$2\frac{1}{2}$ "		
10 "	16 "	$18\frac{1}{2}$ "	3 "	21 "	$1\frac{3}{8}$ "	$3\frac{3}{4}$ "		
12 "	18 "	$20\frac{3}{4}$ "	$3\frac{1}{2}$ "	25 "	$1\frac{5}{8}$ "	$4\frac{3}{8}$ "		
15 "	23 "	$25\frac{1}{4}$ "	4 "	$29\frac{1}{2}$ "	$1\frac{15}{16}$ "	$5\frac{1}{4}$ "		715 lbs
$17\frac{1}{2}$ "	26 "	30 "	5 "	32 "	$2\frac{1}{4}$ "	6 "		925 "
20 "	30 "	32 "	6 "	33 "	$2\frac{7}{8}$ "	$6\frac{3}{4}$ "		1175 "
25 "	35 "	40 "	$6\frac{1}{2}$ "	40 "	$3\frac{3}{16}$ "	$7\frac{1}{2}$ "		2100 "
30 "	$40\frac{1}{2}$ "	46 "	8 "	$47\frac{3}{4}$ "	$3\frac{7}{8}$ "	$8\frac{1}{2}$ "		3100 "
35 "	46 "	51 "	9 "	$55\frac{1}{2}$ "	$4\frac{3}{8}$ "	11 "		4500 "
40 "	52 "	57 "	10 "	$59\frac{3}{4}$ "	$4\frac{7}{8}$ "	12 "		6450 "
44 "	56 "	61 "	11 "	63 "	$5\frac{3}{8}$ "	$12\frac{3}{4}$ "		7850 "
48 "	60 "	66 "	12 "	$65\frac{1}{2}$ "	$5\frac{7}{8}$ "	$13\frac{1}{2}$ "		9425 "
55 "	68 "	75 "	14 "	75 "	$7\frac{3}{8}$ "	$13\frac{5}{8}$ "	From 2 to 6 feet deep, according to size of wheel and quantity of water used.	19000 "

Column A also indicates the proper size of hole to be cut in floor of flume to receive the wheel. For further information as to dimensions in columns C and K see "Instructions for Setting Wheels."

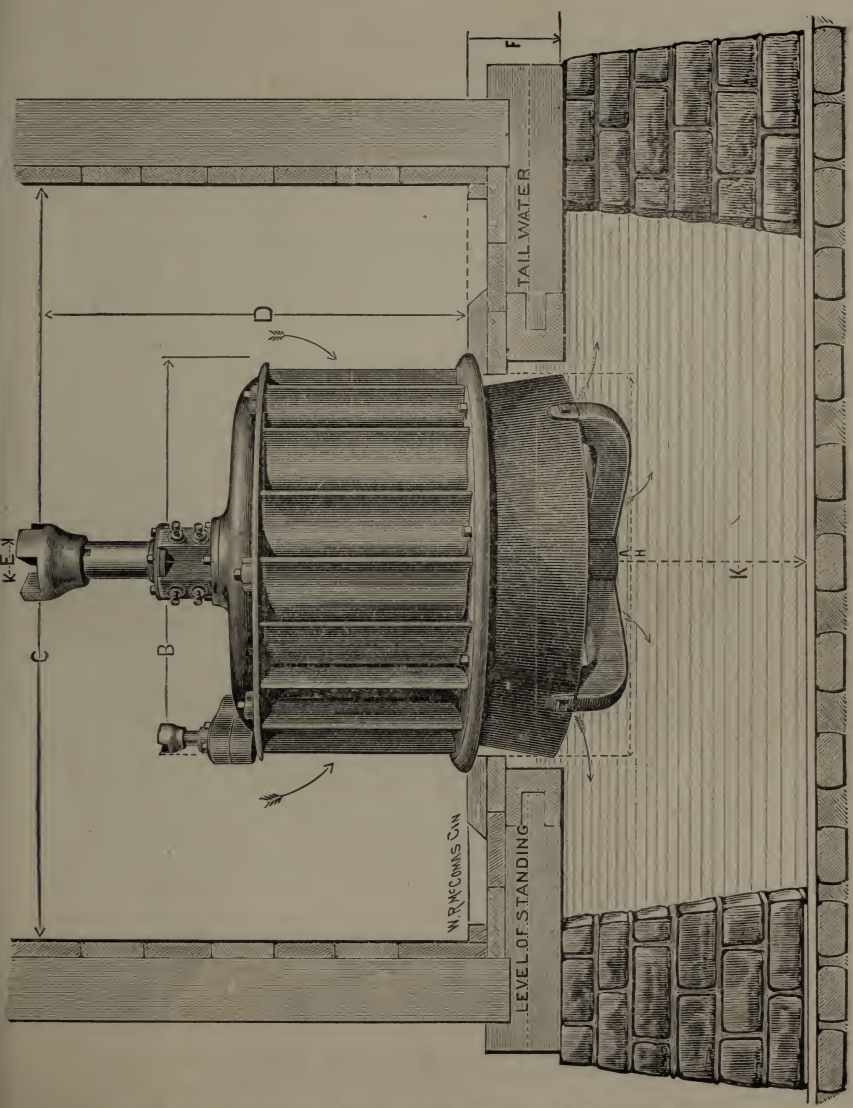

FIG. 6. VICTOR WHEEL SET IN ORDINARY FLUME.

PRICE LIST
—OF—
VICTOR TURBINES.

In selecting a Turbine, price should not be considered alone, but *HIGH EFFICIENCY, SUPERIORITY OF CONSTRUCTION, SIMPLICITY,* and a *PERFECT GATE* should be estimated at a fair value. From and after this date, the following prices will be in force:

6 inch	Wheel,	made	of	Brass	Price	$200
8	"	"	"	"	"	215
10	"	"	"	"	"	225
12	"	"	"	Iron and Brass	"	240
15	"	"	"	Iron	"	250
17½	"	"	"	"	"	290
20	"	"	"	"	"	325
25	"	"	"	"	"	435
30	"	"	"	"	"	550
35	"	"	"	"	"	700
40	"	"	"	"	"	875
44	"	"	"	"	"	1100
48	"	"	"	"	"	1300
55	"	"	"	"	"	2000

IN COMPARING ABOVE PRICES WITH PRICES OF OTHER WHEELS, COMPARE ALSO THE POWER OF THE RESPECTIVE WHEELS, AND COMPUTE THE RELATIVE COST PER HORSE POWER.

The above price-list is for wheels complete, as shown on page 7, delivered free on board cars at Dayton, and includes hand-wheel, one pair of gears, and pawl and ratchet for operating the gate, with short pieces of shafting fitted in each; articles not usually furnished without extra charge.

In ordering wheels state whether they are to run *with the sun*, or *against the sun.*

STILWELL & BIERCE MFG. CO.,
Dayton, Ohio.

JANUARY 1, 1882.

Joel H. Fox, Agt.,
WESTFIELD, MASS.

SQUARE INCHES OF WATER VENTED BY THE VICTOR TURBINE.

Our correspondence indicates a frequent misapprehension of the meaning of the term "square inches of water vented." Some think that in a wheel said to use "100 square inches of water" it is meant that the entire area of the chute apertures measure 100 square inches; others think the meaning to be that the entire area of the discharge apertures is 100 square inches. Neither of these views is correct, but, the meaning is, that the *theoretical discharge* under any head, due to an aperture measuring 100 square inches in cross section, would equal the *actual discharge* of the wheel under the same head. A "square inch of water" means a stream exactly one inch square, and equal in length to the theoretical velocity in feet per second due to the head from under which it issues. For a head of four feet this length would be 16 04 feet per second; for a head of ten feet 25.36 feet per second. This velocity in feet per second, and the equivalent of a "square inch of water" expressed in cubic feet per minute, under heads of from 1 to 40 feet, appear in table on page 38.

6	inch	wheel	uses	12	square	inches	water.
8	"	"	"	19	"	"	"
10	"	"	"	33	"	"	"
12	"	"	"	50	"	"	"
15	"	"	"	73	"	"	"
17½	"	"	"	96	"	"	"
20	"	"	"	119	"	"	"
25	"	"	"	180	"	"	"
30	"	"	"	248	"	"	"
35	"	"	"	383	"	"	"
40	"	"	"	459	"	"	"
44	"	"	"	521	"	"	"
48	"	"	"	614	"	"	"
55	"	"	"	744	"	"	"

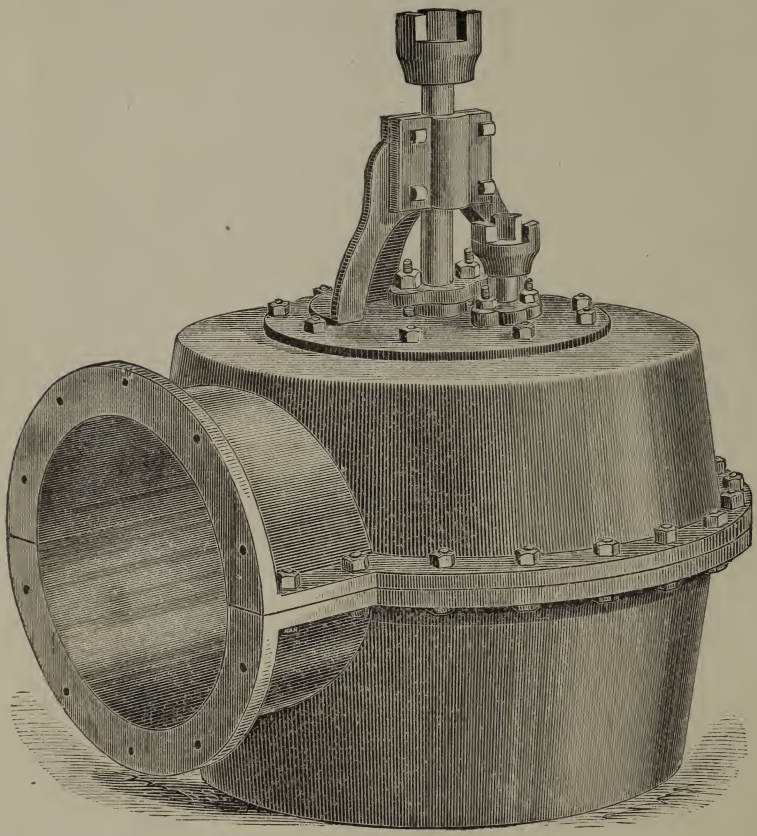

FIG. 7. VICTOR IRON FLUME, WITH WHEEL IN POSITION.

IRON FLUMES AND PEN-STOCKS.

Experience has abundantly proved the superiority of iron flumes and pen-stocks over wood, on account of durability and freedom from leakage. As a rule, the expense of iron is considerably greater than wood, but for some peculiar locations

the cost is no greater, and much better results can be obtained than would be possible with wooden flumes. For small wheels under high heads we especially recommend and urge the use of iron flumes, in which case the wheels are fitted to their place at our works, and that nicety of construction and adjustment of bearings secured, which is so important for wheels running at such a high velocity.

In connection herewith we present an engraving, (Fig. 7), illustrating our iron flume, or outer case, such as we use for wheels up to 17½ inches diameter. It is made as the engraving represents, of two castings bolted together, so it can readily be taken apart, and is provided with a moveable cap, so that the wheel can be taken out entire, the opening being large enough for that purpose. The flange at side is furnished with bolts ready for connecting either with iron or wood trunk, or vertical penstock. The cover is provided with stuffing boxes for both wheel-shaft and gate-stem, and a bridge-tree firmly bolted on, which affords a good, broad oil-bearing for the upper end of the water-wheel shaft. A hand hole (shown in the outline engraving on page 27) affords ready access to the wheel for examination, or for removing obstructions.

In connection with this flume an iron draft-tube of any desired length may be used, and a short piece, say not less than 15 inches, is always necessary. The ring to which the draft-tube is riveted is turned true and snugly fitted to its seat on the inside of flume. The flange of wheel-case is also turned true and rests upon the face of the draft-tube ring, thus forming an air-tight joint.

PRICE LIST OF IRON FLUME.

Complete, as shown on page 22, including the fitting of the wheel and draft-tube to its seat; but not including the draft-tube.

Size of Wheel -	6	8	10	12	15	17½
Price of Flume -	$85	$100	$125	$150	$175	$200

Prices and plans for iron flumes for wheels larger than 17½ inches in diameter, and for all descriptions of iron flumes, draft-tubes, etc., furnished on application.

Its enormous capacity in a small diameter, high per centage of useful effect, simple, strong construction and perfect gate, give to the VICTOR TURBINE a combination of excellencies not found in any other wheel.

The VICTOR embodies the results of all the latest research and experiment in its department of applied mechanics, and marks a new era in the construction of turbines.

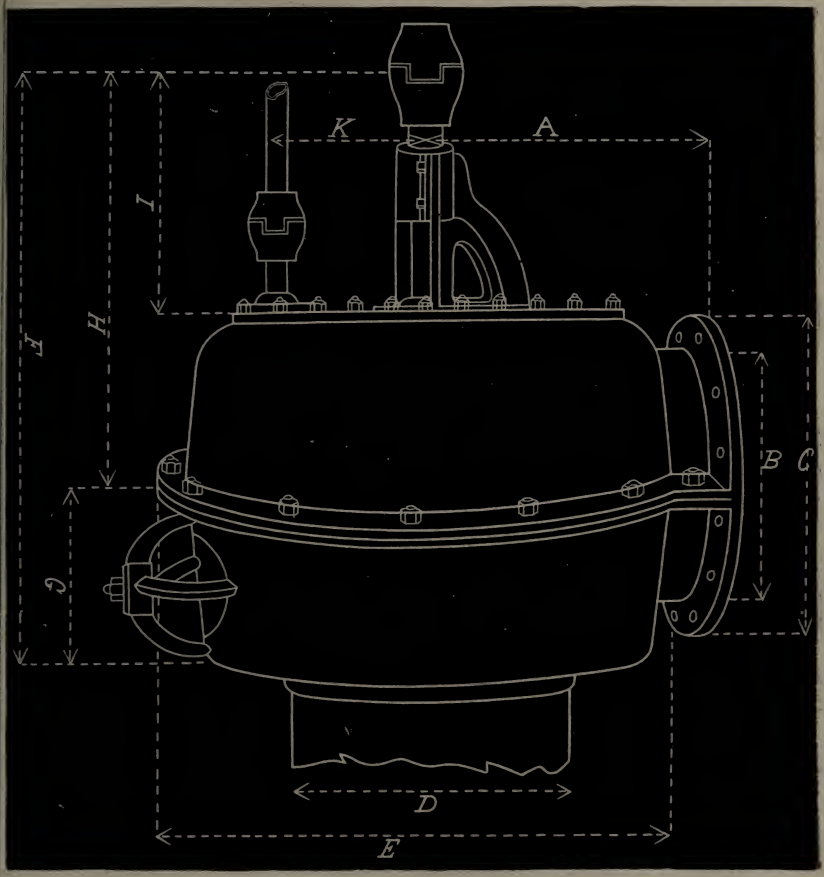

FIG. 8. OUTLINE ENGRAVING OF IRON FLUME.

TABLE OF DIMENSIONS OF VICTOR IRON FLUMES.

Letters at head of Column correspond with dotted lines in above Plate.

SIZE OF WHEEL.	A Distance from face of flange of inlet to center of wheel shaft.	B Diameter of bore of inlet pipe.	C Distance across flange of inlet.	D Diameter of outlet pipe or cylinder.	E Entire diameter of flume.	F Distance from bottom of flume to top of wheel shaft.	G Distance from bottom of flume to center inlet pipe.	H Distance from center of flume to top of shaft.	I Distance from top of flume to top of shaft.	K Distance between center of wheel shaft and gate rod
6 in.	16¾ in.	14 in.	18 in.	10⅜ in.	31 in.	34½ in.	9½ in.	24¾ in.	15⅜ in.	4⅝ in.
8 "	16¾ "	14 "	18 "	14⅛ "	31 "	34½ "	9½ "	24¾ "	15⅜ "	5¾ "
10 "	18¼ "	16 "	20¼ "	16⅝ "	34¼ "	36⅜ "	10½ "	26⅜ "	15⅜ "	7 "
12 "	23⅜ "	24 "	28⅝ "	18⅝ "	45⅛ "	46¾ "	15¼ "	31 "	18 "	8¾ "
15 "	23⅜ "	24 "	28⅝ "	23¾ "	45⅛ "	46¾ "	15¼ "	31 "	18 "	10 "
17½ "	24¼ "	25½ "	30 "	26¾ "	47⅜ "	49 "	15⅝ "	33⅛ "	19¼ "	11 7 16 "

INSTRUCTIONS FOR SETTING WHEELS.

The majority of competent millwrights are perfectly familiar with the proper manner of setting turbine wheels, and as the Victor requires no conditions not essential to all wheels of this class, instructions to them will hardly be necessary. But for the information of inexperienced persons, and to guard against any misunderstanding or failure in putting wheels in properly, we have thought best to lay down some plain general rules by which they may be governed in setting the Victor Wheel.

This is a flume wheel, constructed to rest by the flange of its case or stationery part, upon the floor of the flume, over an aperture in the floor, through which the water is discharged.

No particular form of flume is required, but whether round or square its internal diameter should not be less than stated in column C in Table of Dimensions, page 20.

In erecting a flume to receive the wheel, the first thing to be done is to excavate a wheel-pit of sufficient depth, and, unless it has a rock bottom, put down mud-sills and sheet over the bottom of the pit with two inch plank. For the smallest wheels this pit *should never be less than two feet deep of clear discharge, and from that to six feet or more in depth*, according to the size of the wheel. This pit should be extended out into the tail-race *its full width and depth for several feet beyond the outside of the flume*, and then gradually sloped upward to the general level of the bottom of the tail-race. Too much importance can not be attached to this matter of providing

ample space for the wheel to discharge into, for if there is not sufficient space under the wheel to admit of the water passing away from the wheel **quietly** and **easily**, it will react upon the wheel and seriously interfere with its performance. On page 21, fig. 6, we present a vertical section of an ordinarily constructed wooden flume with the wheel in position, showing the pit under the wheel, and the mud-sill and sheeting, which, as before stated, should always be put down unless the pit has a rock bottom. The cut is so simple and plain as to readily explain itself. The frame and floor of the flume should be strengthened by as many intermediate sills and posts as its size may require. Leave a square in the bottom of sufficient size to receive the cylinder, or draft-tube, of wheel, and spike corner-pieces into this square to assist in supporting the wheel. We urge upon millwrights and mill-owners particular care in the construction of the lower timbers and floor of a flume; for if the floor and frame are not of sufficient strength to support the enormous load generally imposed upon it, but springs, or sags down under the pressure, the wheel is thereby thrown out of plumb, which seriously interferes with its proper performance. Light or week timbers should never be used for the bottom or frame of a flume. The sills should be at least two inches larger each way than the corner posts.

The floor timbers should be placed in the direction of the current, with their upper surface at the height of *standing* tail-water, unless a draft-tube is used.

The intermediate sills may be narrower one way than the other, and should be placed edgewise, and in large

flumes *each corner of the square opening* left in the frame of the floor to receive the cylinder of wheel-case, should be supported by a three or four inch square post, made of *hard, stiff timber*, placed solidly on the foundation, but never place any support under the wheel. Cover the bottom of flume with three-inch plank, and line up the sides with two-inch plank. After cutting out the hole in floor of flume to receive the wheel-case, get out pieces of wood skirting two or three inches thick, and of sufficient width to receive the flange of the wheel-case, spike them down all around the hole, and plane the face of them **perfectly level**; this will insure the wheel setting level, and also a tight joint, as the flange of the wheel-case is turned true and at right angles with the shaft. (See fig. 6.) In adjusting wheels and machinery, great care should always be taken to have all the shafting and bearings in perfect line; and this is especially necessary with small wheels for a little unnecessary friction in the different bearings causes a heavy loss of power.

Another HIGHLY IMPORTANT MATTER is to provide a RACK across the flume, to prevent the passage of drift-wood and other rubbish into the wheel. We recommend the use of iron bars, but if wood is used, make the bars one inch thick and three inches wide, and bevel to an edge on the up-stream side. The bars should be set one inch apart, and less for small wheels, and at an angle of not less than forty-five (45) degrees, so as not to diminish the area of water-way. The rack should be kept clear by frequently raking out the trash which accumulates against it. Attention to this matter removes almost entirely any danger of breaking or clogging the wheel by rubbish passing into it.

CONSTRUCTION

—OF—

Head-Races, Flumes and Tail-Races.

In improving a water power, no part of the same requires more careful consideration than the construction of the water courses leading to and from the wheels, and yet this matter is frequently so poorly engineered as to cause a heavy loss of valuable power. After having first determined how many horse-powers are required, or can be obtained, and how many cubic feet of water per minute is necessary to produce the required power, the next thing is to determine the requisite size of the water courses. The fore bay leading to the flume should be of sufficient width and depth to allow the water to pass to the wheel at a velocity *never exceeding one and a half feet a second*, and should be free from abrupt turns or cramped passages, which break the water into "eddies," thereby diminishing its force and reducing the working head. The tail-race should be of the same capacity, and when practicable of sufficient depth below the surface of the stream into which it empties, to have at least two feet of dead water standing the entire length of the tail-race when the wheels are not in motion; and when a large amount of water is to be used on the wheels, this depth of dead water should be increased to three or four feet. If this is done, the water, as it discharges from the wheel, displaces the dead water, and at once conforms to the general level of the water in the tail-race and river, or receiving canal, and no head is lost. It is not uncommon to see two or three feet of working head lost by not

complying with these conditions. To ascertain the requisite size of flumes and tail-races, use the following simple rule. Our carefully prepared tables of power, etc., will indicate the proper size of wheel to produce the required power, and also the number of cubic feet of water the wheel will discharge per minute. Divide the number of cubic feet stated in the table by 85, and the quotient will be the area in square feet required in the cross section of the head or tail-race for every wheel used. That is to say, for every 85 cubic feet of water used by the wheel or wheels per minute, there should be one square foot in cross section, of all the water-passages leading to and from the wheel, *including, of course,* **the opening under the flume,** *through which the water passes after leaving the wheel.* Larger water-courses than indicated by the above rule are not objectionable, but desirable, for the nearer a state of rest the water can be brought to before entering and after leaving the wheel, the better will be the results obtained. In improving a water-power, properly constructed water-courses will amply repay the labor and money expended upon them, and *are essential to the proper working of any wheel.*

SETTING WHEELS ABOVE TAIL-WATER.

Sometimes in adapting wheels to very high heads, or to otherwise conform to the peculiar location, it becomes necessary to set the wheel some distance above tail-water, and conduct the water away from the wheel through a draft-tube. The same depth of pit and area of discharge are required where a draft-tube is used, as would be were the wheel set at the bottom of the fall, and the mouth

of the draft-tube must always be submerged from two to four inches in *standing tail-water when at its lowest stage.*

Theoretically, draft-tubes may be used of any length up to thirty feet, but *practically* we find it unadvisable to use draft-tubes exceeding twenty feet in length, because of the difficulty in making and *keeping* them *perfectly air-tight;* and if the draft-tube *leaks air at all*, the vacuum is imperfect, and loss of power, due to the loss of head, is the result. Draft-tubes, if used, should be as short as possible, and must be of sufficient *internal diameter* to receive the cylinder of wheel-case, as given in table of dimensions, column A, page 20. If constructed of wood it should extend up through the opening made in the floor of flume, flush with the face of the cants upon which the wheel-case rests, and be firmly secured to the flume by spikes or screws, and be securely banded at frequent intervals with iron hoops. If constructed of iron, which is far preferable to wood, the ring or flange to which the tube is riveted should be faced off true, and let into the cants, so as to form a perfect joint with the flange of wheel-case. As a rule, in all cases where it is practicable, we would advise that the wheel be set at the bottom of the fall, but in all cases where a draft-tube is used, we would recommend having one made of boiler-iron, so as to secure durability and *perfect tightness.*

We are prepared to furnish work of this kind to order.

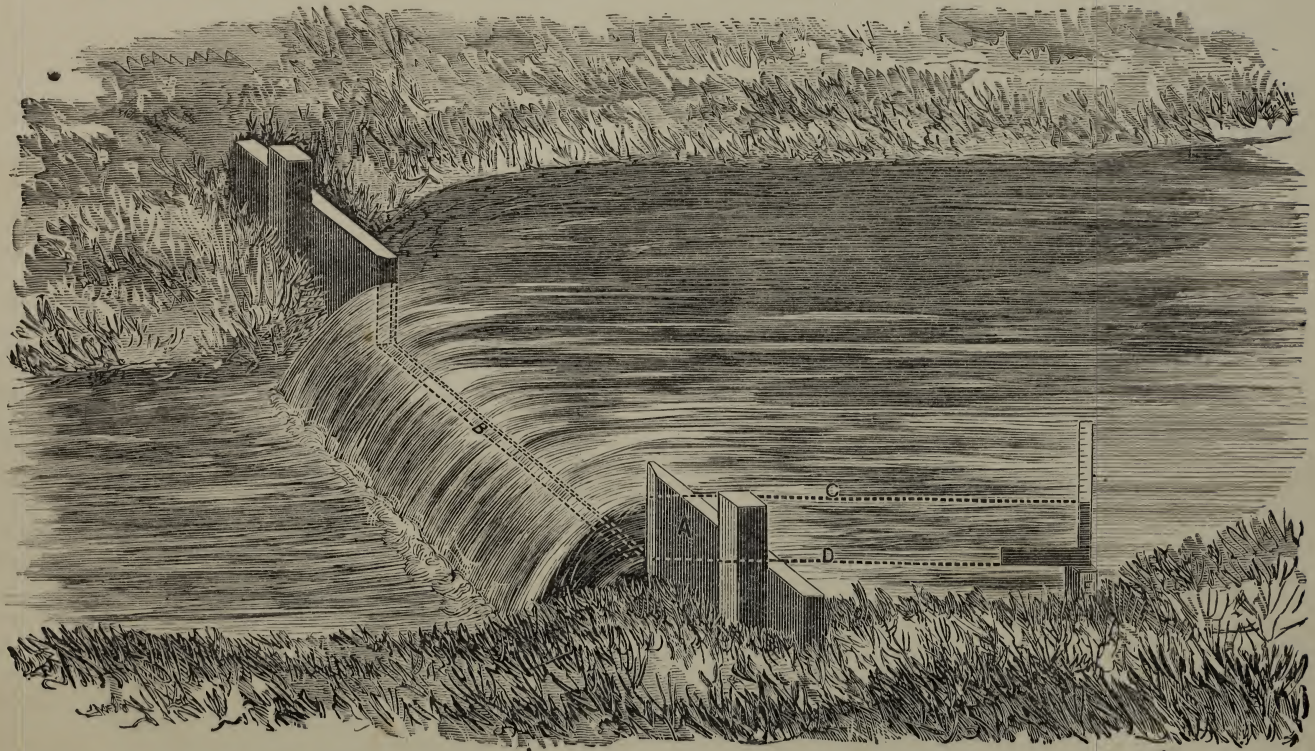

FIG. 9.—WEIR DAM.

MEASUREMENT OF WATER-POWERS.

Before improving a water-power it is necessary to ascertain exactly how much fall can be secured and how much water can be relied upon, as upon these facts depend the value of the proposed improvement. The improvement of a water-power is attended with considerable expense, and to prevent disappointment in discovering, after the proposed mill or factory is completed, that the stream does not afford sufficient power to carry the machinery, we advise parties not to rely upon a mere superficial examination of the stream which it is pro-proposed to improve, but to employ some person who is well versed in hydraulics to carefully measure the capacity of the stream. As this can not always be done, we will give a few simple directions which will enable anybody to determine approximately the amount of water in a stream.

Where the stream is not too wide to admit of it, the simplest mode of measurement is by means of a weir, as shown in Fig. No. 9. Take a board of sufficient length and width to produce a dam across the stream; cut a notch in the top of the board of sufficient depth to pass all the water to be measured; the length of this notch not exceeding two-thirds of the width the stream. The bottom and both ends of this rectangular notch, which is termed a weir, should be beveled on the down-stream side to within one-eighth of an inch of the up-stream side of the board, leaving the edge or crest of the weir, almost sharp and perfectly level. A stake shonld be driven in the bottom of the stream a few feet back of the weir, the top of the stake being exactly level with

the crest of the weir; this level being easily found as the water begins to spill over the weir. After this water has reached its greatest depth make a careful measuaement of its depth over the top of the stake, by means of a squrae, and this measurement will indicate the true depth of the water upon the crest of the weir. The amount of water the stream furnishes can now be computed from the table for weirs on the following page. Care must be taken to have the board of sufficient width to set the water back to a dead level before it passes over the weir, and that the water has a **clear fall** of not less than six inches below the crest of the weir.

An important matter in connection with the measurement of small streams is the possibility of damming, and thus storing up the water, and using it only part of the time instead of constantly. Thus if the natural flow of a stream can be retained in a pond for twelve hours, for the remaining twelve hours double the quantity can be used, and consequently double the power of the stream can be obtained for that length of time. In the case of small streams we request our correspondents to send us the weir measurements, and also state what length of time the water can be dammed or held back.

If the stream be too large to measure conveniently by means of a weir, as above described, select some place in the stream where there is a moderate current, or smooth even flow of water, and measure the velocity by throwing in a *float*, sufficiently weighted to sink it well into the water, and time the passage of this float from one fixed point to another fixed point; and repeat often enough to be sure that you have the accurate time. Now measure

the width of the stream, and its average depth, by taking the depth in several places. Then measure accurately the amount of fall that can be obtained, and send these facts to us, and we will return an estimate of the number of horse-power the stream will produce. We are at all times ready to make estimates and plans for improving water-powers for parties desiring our services.

TABLE FOR WEIRS.

Inches Depth on WEIR.	0	⅛	¼	⅜	½	⅝	¾	⅞
1	0.40	0.41	0.56	0.65	0.74	0.83	0.97	1.03
2	1.14	1.25	1.36	1.47	1.59	1.71	1.84	1.96
3	2.09	2.12	2.36	2.60	2.64	2.78	2.93	3.06
4	3.22	3.38	3.53	3.69	3.85	4.01	4.17	4.35
5	4.51	4.68	4.85	5.02	5.20	5.38	5.56	5.74
6	5.92	6.10	6.30	6.49	6.68	6.87	7.07	7.27
7	7.46	7.67	7.87	8.07	8.28	8.49	8.70	8.91
8	9.12	9.33	9.55	9.77	9.99	10.21	10.43	10.66
9	10.88	11.11	11.34	11.57	11.80	12.04	12.27	12.51
10	12.75	13.15	13.23	13.47	13.72	13.96	14.21	14.46
11	14.71	14.96	15.21	15.46	15.72	15.98	16.24	16.49
12	16.76	17.02	17.28	17.55	17.82	18.08	18.35	18 62
13	18.89	19,17	19.44	19.72	20.00	20.27	20.56	20.83
14	21.12	21.40	21 68	21.97	22.26	22.55	22 83	23.13
15	23.42	23.71	24.01	24.30	24.60	24.90	25.19	25.50
16	25.80	26.10	26.41	26.71	27.02	27.32	27.63	27.94
17	28.26	28.57	28.88	29.19	29.51	29.83	30.14	30.46
18	30.78	31.11	31.43	31.75	32.07	32.40	32.73	33.05

The above table for weirs gives the number of cubic feet per minute that will pass over a weir one inch wide, and from one inch to eighteen and seven-eighth inches deep. In the left-hand column, marked "inches depth on weir," is the depth of water flowing over the weir, and the second column, under 0, is the number of cubic feet per minute for the even inches in depth. In the third column, under one eighth, is the amount of the second

column, with the additional one eighth inch in depth added, and so on across the table from left to right.

By multiplying the number of cubic feet that one inch in width will discharge, as stated in table, by the width of the weir in inches, the result will be the total discharge of weir per minute. The depth on the weir should be measured at a point just back of where the curve on the surface of the water commences.

VELOCITY AND DISCHARGE OF WATER THROUGH SUBMERGED ORIFICES.

Table showing the theoretical spouting velocity of water in feet per second and number of cubic feet discharged per minute, through an orifice of one inch area, under different heads, from one to forty feet.

(CALCULATED FROM FRANCIS' FORMULAS.)

Head in feet...	Velocity per second in feet.	Cubic feet per minute, area of orifice 1 in.	Head in feet...	Velocity per second in feet.	Cubic feet per minute, area of orifice 1 in.	Head in feet...	Velocity per second in feet.	Cubic feet per minute, area of orifice 1 in.	Head in feet...	Velocity per second in feet.	Cubic feet per minute, area of orifice 1 in.
1	8.02	3.34	11	26.60	11.08	21	36.75	15.31	31	44.65	18.60
2	11.34	4.73	12	27.78	11.57	22	37.62	15.66	32	45.37	18.90
3	13.89	5.78	13	28.91	12.05	23	38.46	16.02	33	46.07	19.20
4	16.04	6.68	14	30·00	12.49	24	39.29	16.36	34	46.76	19.48
5	17.93	7.47	15	31.06	12.94	25	40.10	16.71	35	47.45	19.76
6	19.64	8.18	16	32.08	13.36	26	40.89	17.04	36	48.12	20.05
7	21.22	8.84	17	33.06	13.77	27	41.67	17.36	37	48.78	20.33
8	22.68	9.45	18	34.02	14.18	28	42.43	17.68	38	49.44	20.60
9	24.06	10.02	19	34.96	14.57	29	43.19	17.98	39	50.08	20.87
10	25.36	10.57	20	35.87	14.94	30	43 93	18.30	40	50.72	21.13

The above table represents the *THEORETIC* velocity and discharge due to an orifice conformed in all respects to the shape of the contracted vein. *In ordinary practice through orifices having parallel sides the actual velocity and discharge will be but about 64 per cent of the table.* Bearing this fact in mind the above table may be used with reasonable accuracy in measuring the discharge of water through ordinary gate openings onto overshot and breast wheels, through waste gates, and other apertures cut in plank. Example: Suppose the opening through which the water passes onto an over-

shot wheel to be 72 inches long, and the gate to be hoisted 2 inches, what amount of water will it discharge per minute, with three feet head of water in the forebay above the opening? Solution: 72″x2″ =144 square inches x 5.78 (the discharge stated in table for an orifice of one inch area under 3 feet head) =832 cubic feet *theoretic* discharge per minute, 64 per cent of which=532 cubic feet *actual* discharge per minute.

Their are many instances in powers already improved where the quantity of water in a stream can be ascertained, by using the above table, without resorting to measurement by weir.

In ascertaining the head of water under which an orifice is discharging, measure from the surface of the water to the center of the orifice.

SPECIAL NOTICE TO CORRESPONDENTS.

We frequently receive letters of inquiry in which all or part of the facts necessary to enable us to make a definite reply are omitted. If correspondents will always give the following data, much delay will be prevented in furnishing them the desired information:

State clearly your Post-Office, County, and State.

What is the full head or vertical distance from surface of head-water to the surface of tail water, when at rest?

What quantity of water, in cubic feet, per minute can be relied on?

What kind of machinery is to be driven, and kind and amount of labor to be performed?

STATE ALL PARTICULARS; it takes less time to read long letters than it does to write for further particulars.

IN ORDERING WHEELS state clearly which way the wheel is desired to run, WITH OR AGAINST the sun.

Also, give full shipping directions, if any particular route is preferred.

COMPACTNESS, SIMPLICITY, STRENGTH AND ACCESSIBILITY OF ALL ITS PARTS ARE PRE-EMINENT FEATURES IN THE CONSTRUCTION OF THE VICTOR TURBINE.

Prominent Points of Superiority.

In this connection permit us to briefly recapitulate the points of superiority found in the Victor Turbine.

Its Enormous Capacity, being from two to three times greater than other turbines of the same diameter.

Its unparalleled efficiency, in point of economy in the use of water, steadiness of motion, and reliability in all respects.

Its thorough simplicity, being composed of the smallest number of parts, all of which are very strong and readily accessible in case of necessity.

Its perfect Gate, which operates easily and quickly under any head, admits of perfect control by a governor, shuts tight, and is so simple and so thoroughly protected that it can not get out of order.

Its mechanical construction, which is conceded to be very superior in all respects. All of the tested wheels before referred to were taken from our regular stock to fill orders, and received no extra finish of any kind.

Its enormous capacity in a small diameter, high percentage of useful effect, simple, strong construction, and perfect gate, give to the VICTOR TURBINE a combination of excellencies not found in any other wheel.

PRACTICAL TESTS.

The power developed by the VICTOR is so very great as compared with other Wheels of same diameter, that a good many are incredulous on the subject even in the face of the scientific tests herewith reported (page 11), and are disposed to say, "The Wheel certainly shows well in the Testing Flume, but will it do equally well in driving my machinery?" The statements hereto annexed of prominent parties in their respective lines of business will be of interest to such:

OFFICE OF CHAS. A. PILLSBURY & CO.
Minneapolis, Minn., December 17, 1881.

Stilwell & Bierce Mfg. Co., Dayton, Ohio.

Gentlemen—Your favor of the 14th, referring to the 55 inch Victor Turbine that we have in our "A" Mill received. We can not tell the power it will give because we have never had a chance to test it with a full gate. We have never known the gate to be more than three-fourths open, but on that gate we have made some 2,550 barrels of flour in twenty-four hours. When we get the second half of the mill running we shall be able to test it thoroughly. Our actual working head in the mill is about 50 feet. We have in the one-half now running, 101 sets of the Gray Double Rolls (that is to say four rollers in each machine), 100 middling purifiers, about 130 reels, the wheat-cleaning machinery, and other milling machinery to match. We also move all our cars by power from the wheel, and can attach seven or eight loaded cars to our cable and never notice the difference by any decrease of power or speed. We have no trouble at all with the step, nor with the wheel in any way, shape, or manner. It would be impossible for the wheel to give better satisfaction. None can give steadier power or better results than yours. We are surprised that the wheel should be strong enough to stand such an enormous strain, but we have never yet had occasion to even look at the wheel.

Yours truly,
CHAS. A. PILLSBURY & CO.

[NOTE.—The above 55-inch wheel, under 50 feet head, is capable of producing about 1,400 horse-power, which is far in excess of the power developed by any other one water wheel of any kind within our knowledge. A wheel similar to the above is driving the great Washburn "A" Mill at Minneapolis, and before being placed in the wheel-pit its mechanical construction was carefully examined by a large number of mechanical experts, including the editor of the *Northwestern Miller*, who paid it the following unsolicited editorial comment.—S. & B. Mfg. Co.]

[From *Northwestern Miller*, March 18, 1881.]

"It is a pleasure to a man of a mechanical turn of mind, who can appreciate good work when he sees it, to find a job that will bear the closest scrutiny. Such a piece of work was that recently placed in position in the Washburn "A" Mill in this city, viz: one of the widely known "Victor" water wheels made by Stilwell & Bierce Mfg Co., of Dayton, Ohio. The wheel (the general manner of construction of which is well known to our readers) is 55 inches diameter, and weighed, including case and gate, over nine tons. Not only was the machine work well done, but the castings were remarkably perfect. Not a blow-hole, or scab, or mark of the chisel anywhere, while the surfaces were almost as smooth as if finished by machinery. When the intricate construction of the castings is taken into account, the work is worthy of especial commendation, and does great credit to the manufacturers. As a specimen of foundry-work this wheel was pronounced by all who inspected it as superior in every way to anything in the line they had before seen. The wheel is calculated to yield, under a head of forty feet, 1,000 horse.power, and will drive the machinery in the half of the 'A' Mill now being finished."

Standard Flouring Mill, Minneapolis, Minn., June 2, 1881.
Stilwell & Bierce Mfg. Co., Dayton, Ohio.

Gentlemen—We are well pleased with the 44-inch Victor Wheel. It is running under 28 to 30 ft. head. Have made over 1,100 barrels flour in twenty-four hours, at same time run our large storage elevator, with considerably less than full gate. We think under 30 ft. head we can make 1,300 to 1,500 barrels per day.

Yours truly, E. V. WHITE & CO.

The above wheel is tabled at only 448 horse power under 30 ft. head. With that amount of power to have produced 1,100 barrels flour per day (four-tenths of one horse power per barrel) would have been a splendid showing, but it will be observed the wheel also drove their large storage elevator, and did it all with considerably less than full gate.

North-Western Roller Mill, Minneapolis, Minn., June 6, 1881.

Messrs. Stilwell & Bierce Mfg. Co., Dayton, Ohio:

Gents—We have used the Victor Wheel for sometime, and are well pleased with it, giving us perfect satisfaction. With the 30 inch wheel we made eight hundred (800) barrels per day, and with the 44-inch wheel we easily make one thousand (1,000) barrels per day, with slightly more than one half a gate of water.

We predict for your wheel great success, and cheerfully recommend it to any and all in want.

Yours, SIDLE, FLETCHER, HOLMES & CO.

The above result we believe to be unprecedented. The 30 inch wheel under 38 feet head, the head under which it operated when making 800 barrels of flour per day, is tabled at only 311 horse power. The mill was afterwards greatly enlarged, and a 44-inch Victor was substituted in place of the 30-inch wheel.

In the fall of 1879 we furnished Moseley & Motley, of Rochester, N. Y., a 17½-inch Victor to take the place of a 25-inch "Centennial Tait" Wheel, and a 23-inch "Leffel" Wheel, guarantied to do more work than both of them did. We append their statement of the labor it is performing:

Flour City Flouring Mills, Rochester, N. Y., April 5, 1880.

Stilwell & Bierce Mfg. Co., Dayton, O. G. N. Bierce, Sec'y:

Your favor of the 2d received. In reply would say that we are running the 17½-inch Victor under 29 feet head, (10 feet head, 19 feet suction) and are driving 6 run of stone, and other machines for gradual reduction equal to about 4 run more, taking in all from 80 to 100 horse power. Yours truly,

MOSELEY & MOTLEY.

Lincoln, Nebraska, Dec. 23, 1881.

Stilwell & Bierce Mfg. Co., Dayton, Ohio:

Gentlemen—In reply to yours of the 10th inst. We have one 25-inch Victor under 13 feet head, driving our Woodlawn Mills—one hundred and twenty-five barrels per day. One 35-inch Victor, under 10 feet head, driving our Capital Mill—two hundred barrels per day. Both are giving satisfaction and doing their work.

Respectfully, KENDALL & SMITH.

OFFICE OF SAXTON & THOMPSON, MERCHANT MILLERS.
Lockport, N. Y., December 21, 1881.

Stilwell & Bierce Mfg. Co., Dayton, Ohio:

Gentlemen—Yours of the 19th inst. is before me. In reply to your inquiries as to the amount of work the Victor Wheel is doing, etc., would say that it is driving four bolting chests of six reels each, fourteen set of Steven's Rolls, 9x30, six scalping reels, one large bran duster, six large size Smith's Purifiers, and all the necessary elevators and conveyors for the above and two packers. The wheel is working under a 25-foot head and doing its work very satisfactorily. I think the wheel would do one third more work than it is doing. We have never used near all the gateage. It has never given one minute's trouble thus far. I consider it the best wheel I have any knowledge of. Yours truly,

HENRY GRIGG.
Superintendent for Saxton & Thompson.

During the summer of 1881 we furnished Cutler & Co., merchant millers at North Wilbraham, Mass., a 44-inch Victor Wheel to run under a 13-foot head, and drive their large mill, requiring 120 horse power. In a recent letter they were pleased to speak of the wheel as follows:

* * * "We were well aware of the merits of your wheel long before we purchased. We are well pleased with its operations, and are free to confess that it surpasses our expectations. We have recommended it to our friends for a number of years, and expect to continue to do so for many years to come."

Minneapolis, Minnesota, December 19, 1881.

Stilwell & Bierce Mfg. Co., Dayton, Ohio:

Gentlemen—Your valued favor of the 14th, asking our opinion of the Victor Wheel, is at hand. In reply would say that we have now used a 35-inch wheel about eleven months, and it has always given the best of satisfaction, doing all that you claimed for it. We grind 500 barrels daily with it, under a 30-foot head, and use less than a half gate. It is easily handled, and we would not exchange it for any wheel we known of.

Very truly yours,

D. R. BARBER & SON.

The above wheel displaced a 48-inch "American" turbine wheel which did not afford sufficient power.

Otsego, Michigan, January 1, 1880.

Messrs. Stilwell & Bierce Mfg. Co., Dayton, Ohio:

Gents—We have now used the 35-inch Victor Wheel a sufficient length of time to determine to our entire satisfaction its ability to perform the work you guaranteed it to do, viz: to drive one 4-foot stone and corn sheller, to grind 30 bushels of feed per hour, one 30-inch middling stone, buckwheat bolt, smutter, elevators, etc., connected with them. Our average head is 7 feet, and when running but the two stones and sheller, we hardly ever use over two thirds gate. Under the circumstances (the wheel not having as much room under it as it ought to for discharge) it has exceeded our expectations, and is the best wheel we have any knowledge of. The firm of A. B. & C. D. Stuart have just commenced using the 40-inch Victor you sold them, and they are very much pleased with it. They are now satisfied they can double the amount of machinery in their factory and have sufficient power to drive it *strong*. Should you wish to refer any of our acquaintances to us for information concerning the Victor Wheel, we will gladly tell them all we know about it. Yours, etc,

MANSFIELD & HOAG.

Elk River, Minn., November, 21, 1881.

Stilwell & Bierce Mfg. Co., Dayton, Ohio:

Dear Sirs—We bought last spring a 35-inch Victor, to work under 8 feet head, and drive 9 sets of rolls, and all the bolts, elevators,

etc., connected with the rolls. We were quite fearful that it would not do the work, and only took it on Mr. Bierce's guarantee. It, however, carries its load with ease, and is altogether the best wheel we have ever used. It has more than double the power of other turbines of the same diameter.

Very truly yours, MILLS & HOULTON.

Mitchell, Dakota, Dec. 24, 1881.

Stilwell & Bierce Mfg. Co., Dayton, Ohio:

Gentlemen—Yours of the 10th inst., making inquiry in regard to the 35-inch Victor water wheel we bought of you, has been received. In reply will say the wheel is giving perfect satisfaction. It fully meets our expectations. We are running one run of 36-inch burrs, one California Smutter and Separator combined, one Brush machine, and the necessary bolts, elevators, purifier, and have not used to exceed one half gate, with from 4½ to 5 feet head of water.

Yours respectfully,

JOHN R. WHITE.

We occasionally meet parties who doubt the ability of our wheel to compete with overshot wheels of 14 to 16 feet diameter on light streams. We are doing it in numerous places, with results similar to those set forth in the following:

Mortonsville, Woodford Co., Ky., Dec. 13, 1881.

Stilwell & Bierce Mfg. Co., Dayton, Ohio:

Gents—I have been using the 17½-inch Victor Turbine long enough to give it a thorough test, and am highly pleased with it. Under a head of 16 feet it has taken the place of two overshot wheels, 14 feet diameter, 3 feet face, and is doing more work than both of them did, and what is *astonishing to me*, is using *less water* than the overshots did. The wheel is driving 2 pairs of 4-feet burrs (corn and wheat), besides smutters, reels, elevators, etc., and is grinding 9 bushels of wheat and 12 bushels of damp corn per hour to-day with only 13 feet head, having 3 feet back-water in the tail-race. I can recommend it as a strong and uniform motor, fully up to your tabled capacity of it, acting well at part-gate, and for its freedom from clogging with rubbish.

Very truly yours, W. H. SELLERS.

Rochester Paper Co., Rochester, N. Y., June 2, 1881.
Stilwell & Bierce Mfg. Co., Dayton, Ohio:

We are running three 25-inch Victor Wheels, under a head of 29 to 30 feet. One of these drives four 600 lb. beating engines, one Jordan engine, and one machine shop. It displaced a 36-inch "Tait Centennial" Wheel.

Another drives three 550-lb. engines (beaters), two No. 3 Holly Power Pumps, one 3-inch boiler pump, and our elevator.

The third one, which displaced a 36-inch "American" Wheel, drives four 600-lb. washing engines, four rag-cutters, dusters, etc. Also a hoister for rags in bales.

We also run a 35-inch Victor which drives five Feckett wood pulp machines, and has quite a large reserve of power. This runs under 30 feet head. The wheels run easily on steps, and come as near table power as any wheel we ever used.

Yours truly, ROCHESTER PAPER CO.
By A. M. HASTINGS, President.

In the fall of 1880 we furnished the Ypsilanti Paper Company a 48-inch Victor to replace a 66-inch "New American" which had gone to pieces after a short run. They were fearful it would not afford sufficient power, but as it was the largest wheel we had on hand, they concluded to try it. Results are stated below.

The Ypsilanti Paper Company, Ypsilanti, Mich., May 31, 1881.
Stilwell & Bierce Mfg. Co., Dayton, Ohio:

In reply to your inquiry, we would say we like the 48-inch Victor Wheel very much. With 13 ft. head, we can run five 800-lb. engines, one Jordan engine, and a pump. This gives us plenty of power to grind stock to make six tons printing paper per day, our regular run. It has not caused a moment's delay since first started. We generally have sixteen feet fall, only using part gate.

Very respectfully yours, CLARK CORNWELL, Sec'y.

The Delaney & Munson Manufacturing Co., paper manufacturers, were using a 48-inch "Leffel" wheel in perfect order, and were short of power. They displaced it with a 35-inch Victor, and added considerably more machinery.

The Delaney & Munson Mfg. Co., Unionville, Conn., June 24, 1881.
Stilwell & Bierce Mfg. Co., Dayton, Ohio:

Gents—Your favor of the 28th ult. was duly received but got mislaid, hence this delay in answering. The 35-inch Victor Wheel we have now run about one year, and under 15 feet head is driving four 500-lb., and one 800-lb. rag engines, and in addition to this, furnishes power for rag room, running rag-cutter and two dusters, also large pump to furnish wash water. To do this work we have plenty of power, and we find it a steady running wheel, both at full and partial gate. Yours truly,

L. RICHARDS, Treasurer.

The Hart Lot Paper Co., of Hart Lot, New York, are using a 30-inch wheel under 21 ft. head, driving five beating engines, etc. In a letter dated December 22, 1881, they speak of the wheel's efficiency as follows:

* * * "In economy of water it can not be beat—that we have fairly tested to our own satisfaction, and the writer has had considerable experience in running almost all the leading wheels. As your wheel stands to-day it is the best on our stream, and the manufacturers are looking into it," etc.

Flint, Mich., December 20, 1881.
Stilwell & Bierce Mfg. Co., Dayton, Ohio:

Gentlemen—You favor of the 17th inst. at hand. I will say of the 44-inch Victor turbine water wheel bought of you, that it is the best thing in the shape of a water wheel that I have any knowledge of. Yours most respectfully,

F. R. LEWIS.

The above wheel runs under a head of from 4 to 6 feet.

Marseilles, Ills., December 19, 1881.
Stilwell & Bierce Mfg. Co., Dayton, Ohio:

Gents—Yours of the 17th inst is at hand and contents noted. We are pleased to say that the 48-inch wheel we bought of you has been in use some sixty days, and thus far done all you claimed for it. We are at present using it with about 7 feet head, and drives

equal to four engines 36x40, with a small flume and a small out-let for the discharge water. The wheel would drive five engines under the same head were it not for the disadvantage it labors under.

Yours respectfully, DWIGHT PAPER CO.

A. A. CARPENTER, Sup't.

From the Niles Tools Works, Hamilton, O., where a 15-inch Victor displaced a 25-inch "American" Wheel:

Niles Tools Works, Hamilton, Ohio, May 31, 1880.

Stilwell & Bierce Mfg. Co., Dayton, Ohio:

Gentlemen—We are now using your Victor Wheel, and are pleased to report that it is doing nobly. It is a 15-inch wheel, working under 26 feet head, and furnishes all the power required in our establishment. Our machine shop is 400 feet long and 60 feet wide, filled with tools of all kinds; in our pattern shop we run a pony planer, a circular saw, a band saw, and three lathes; in our foundry we run a large Root blower, emery wheels and cleaners, and we have ample power for all this duty. We are also lighting our works by electric light, using a six-light Brush machine, running at 900 revolutions, taking power from our line shaft, and running it very steadily. We can not speak too highly of your wheel. It replaced a 25-inch wheel, and is doing much more service.

Yours truly, NILES TOOL WORKS.

R. C. MCKINNEY, Sec'y.

From Falls Rivet Co., Cuyahoga Falls, Ohio, where 25-inch Victor displaced a 35-inch "Leffel" Wheel:

Stilwell & Bierce Mfg. Co., Dayton, Ohio:

Gentlemen—It is now about a year since we purchased of you a 25-inch Victor Wheel, and are much pleased with it. It fills the bill in every particular. It has run steadily night and day, and we have not had a moment's bother with it. Always reliable. It does more work, and much more satisfactory, than the 35-inch Leffel which it displaced. In fact it is doing much more, having added more machinery to it. We call her the "Giant," and truly think it is the best wheel made, and very properly named the "Victor."

Truly yours, FALLS RIVET CO.

E. L. BABCOCK, Agent.

War Eagle Mills, Benton Co., Ark., Dec. 16, 1881.

Stilwell & Bierce Mfg. Co., Dayton, Ohio:

Dear Sirs—I am using one of your 35-inch Victor water wheels under 7 feet head, and can cut 10,000 feet of inch lumber in 10 hours with 5 hands. It works to my entire satisfaction, and has never cost me a cent for repairs, and I can not say too much in its favor. Yours truly,

J. A. C. BLACKBURN.

Westfield, Mass., June 10, 1881.

Mr. W. J. Sumner:

Dear Sir—In reply to yours of the 4th inst., asking how I like the 15-inch Victor Wheel, will say that I am more than satisfied with it. Under 15 feet head it runs a 48-inch saw with good effect, cutting 3,000 to 4,000 feet of hemlock lumber per day. I would not exchange it for any wheel I ever saw.

Yours respectfully, M. V. STOW.

Chicago, November 28, 1881.

Stilwell & Bierce Mfg. Co., Dayton, Ohio:

Gentlemen—Your favor of recent date inquiring how we were satisfied with our new Victor Water Wheel, was duly received. In reply it gives us pleasure to say that we have now used your 20-inch Victor Wheel, under a 25-foot head, since May last, in our Tile Factory at Ottawa, Ills., and have found it most satisfactory in every respect. In fact it has proved itself capable of all that you claimed for it, and we can heartily recommend it as the best wheel we know of for simplicity of working, and economy of water.

Yours respectfully, THE OTTAWA TILE CO.

C. V. JOHNSON, Sec'y and Treas.

A very severe test of a turbine's economy in the use of water, and also its durability, is found in the use of very small wheels under high falls, and with widely varying quantities of water. Such a test has been afforded the Victor by J. S. Graham & Co., Rochester, N. Y., in their large shop for manufacturing woodwroking machinery. They had in use a very large overshot wheel

which was replaced last summer by an 8-inch Victor in iron flume under *seventy-three feet fall.* The water is supplied from hydraulic canal through a surface guage measuring 30 inches wide by 12 inches deep when water is plenty, but reduced to an opening 7½ inches wide by 14 inches deep at low water, which is less than one third the capacity of the wheel at full gate under that head. Messrs. Graham & Co. wrote us under date of December 16, 1881, as follows:

"We started your wheel (8-inch Victor) August 16th, and it has been running constantly ever since that time, an average of thirteen hours per day, without losing a minute through fault in the wheel. We have 73 feet fall, and had no trouble in keeping the machinery to speed at low water last summer with an opening 7½ inches wide by 14 inches deep, giving at least 35 horse power. Before purchasing, we made an examination of the various wheels made and selected the Victor, and it has proved to be all you claimed or we expected. Yours truly,

J. S. GRAHAM & CO."

It will be observed that the foregoing statements relate to wheels of nearly all the sizes manufactured by us, driving a great variety of machinery, and operating under falls varying from 4 feet to 73 feet in height. We could fill a good-sized pamphlet with similar testimony, but the above will suffice to prove that the Victor Turbine does just as well at actual labor as it does in the Testing Flume

REFERENCES.

Notwithstanding the convincing character of the testimony herewith presented of the great superiority of the Victor Turbine, we urge upon parties who are investigating the water wheel question, to visit places where our wheels are in use and see for themselves. To facilitate such a personal investigation of the merits of the Victor, we append a partial list of parties using it, and who we feel assured will extend to visitors all reasonable facilities for observing the actual work of their wheels.

Flour Mills.

Chas. A. Pillsbury & Co., Minneapolis, Minn., Pillsbury "A" Mill, 55-inch wheel, 50 feet head, 3,000 barrels per day; Pillsbury "B" Mill, 44-inch wheel, 30 feet head, 1,000 barrels per day; Pillsbury "Excelsior" Mill, 35-inch wheel, 30 feet head, 700 barrels per day.

Washburn "A" Mill, Washburn, Crosby & Co., Minneapolis, Minn., 55-inch wheel, 40 feet head, 2,300 barrels per day.

"Cataract Mill," D. R. Barber & Son, Minneapolis, Minn., 35-inch wheel, 28 feet head, drives entire mill, 500 barrels per day.

"North Star Mill," H. J. G. Crosswell, Minneapolis, Minn., 30-inch wheel, 20 feet head, drives entire mill, 300 barrels per day.

"Humboldt Mill," Hinkle, Greenleaf & Co., Minneapolis, Minn., 35 feet head, 30-inch wheel, drives entire mill, 700 barrels per day.

"Galaxy Mill," Cahill, Fletcher & Co., Minneapolis, Minn., 35 feet head, 30-inch wheel, drives entire mill, 700 barrels per day.

"Northwestern Mill," Sidle, Fletcher, Holmes & Co., Minneapolis, Minn., 35 feet head, 44-inch wheel, drives entire mill, 1,100 barrels per day.

"Standard Mills," E. V. White & Co., Minneapolis, Minn., 30 feet head, 44-inch wheel, drives entire mill, 1,100 barrels per day.

"Model Mills," Russel, Heinline & Co., Minneapolis, Minn., 30 feet head, 25-inch wheel, displaced 35-inch "Bodine Jonval" Wheel, and drives entire mill, 300 barrels per day.

Mansfield & Hoag, Otsego, Mich., 7 feet head, 35-inch wheel.

C. B. Palmer & Co., Dayton, O., 30-inch wheel, 9 feet head.

Wm. Forsman, Circleville, Ohio, 9 feet head, 25 and 20-inch wheels, displaced Overshot and "Leffel" wheels.

Hiram File, Raymertown, N. Y., 22 feet head, 15-inch wheel, displaced "Leffel" Wheel.

Cedar City Milling Co., Cedar City, Utah, 22 feet head, 15-inch wheel, drives entire mill.

Jesse Ames Sons, Northfield, Minn., 9 feet head, two 48-inch wheels, drive entire mill, and displaced 6 "Leffel" and 2 "Houston wheels.

Ezra Bostwick, Union City, Mich., 8 feet heed, 30-inch and 25-inch wheels, drive entire mill.

Hon. James Emmett, Waverly, Ohio, 18 feet head, 20 inch wheel, displaced Overshot.

R. L. Frazee, Frazee City, Minn., 10 feet head, 40-inch wheel, drives entire mill.

Hoyt & Seager, Frontenac, Minn., 21 feet head, 20-inch wheel, drives 4 run mill complete.

R. Critchfield, Howard, Knox County, Ohio, 12 feet head, 15-inch wheel, displaced Overshot.

E. T. Archibald & Co., Dundas, Minn., two 48-inch wheels, 8 feet head, drive entire mill, displaced five "Leffel" wheels.

Henry Oswald, Minneapolis, Minn., 26 feet head, 17½-inch wheel, drives entire mill. displaced five "Bodine Jonval" wheels.

W. W. Cargill & Bro., Hokah, Minn., 7 feet head, 48-inch wheel, drives entire mill, displaced 48-inch "Craik" and 54-inch "Muliken" wheels.

Wm. Lea & Son, Wilmington, Del., 25-inch wheel, displaced Overshot.

Conrad Amendt, Piqua, Ohio, 9½ feet head, 35-inch wheel, drives entire mill.

Cornelius Hilliary, Bladensburg, Knox Co., Ohio, 10 feet head, 15-inch wheel, displaced Overshot.

J. A. Carpenter, Carpentersville, Ills., 8 feet head, one 40, one 35, and two 30-inch wheels.

Mosely & Motley, Rochester, N. Y., 29 feet head, 17½-inch wheel, displaced 25-inch "Tait" and 23½-inch "Leffel" wheels; and 20-inch displaced Overshot, drive entire mill.

H. H. & D. F. Lantz, Plainwell, Mich., 10 feet head, 25-inch wheel. Mill located at Baldwin, Mich.

James Scott, River Forth, Tasmania, Australia, 10 feet head, 17½-inch wheel, 2 run burrs and machinery.

Wm. Leach, Belle Plain, Kansas, 20-inch wheel, 10 feet head, 2 run mill complete.

C. Heebner, Norristown, Pa., 9 feet head, 35-inch wheel, displaced Overshot.

Huxtable & Co., Laurel, Ind., 16 feet head, 20-inch wheel, drives entire mill.

A. J. Weingardner, Rushville, Fairfield County, Ohio, 15-inch wheel, 9 feet head.

Rankin & Conly, Pall Mall, Tenn., 25-inch wheel, 6 to 8 feet head, drives entire mill.

H. Elerding, Sheridan, Ills., 17½-inch and 12-inch wheels, 11 feet head, drive entire mill.

Hillsboro Mill Co., Hillsboro, Wis., 17½ and 12-inch wheels, 16 ft. head, drive entire mill.

E. Bradfield & Son, Ada, Mich., 35-inch wheel, 5 to 6 feet head.

F. N. Quale, Toledo, Ohio, 30-inch wheel, 23 feet head.

A. A. Taylor, Mt. Vernon, Ohio, 35-inch wheel, 18 feet head, drives entire mill.

Bowers & Mosher, Holyoke, Mass., 30-inch wheel, 20 feet head, drives entire mill.

Weld & Hill, Medina, N. Y., 17½-inch wheel, 33 feet head.

Cutler & Co., North Wilbraham, Mass., 44-inch wheel, 13 feet head, drives entire mill.

Chas. N. Flint, Rolla, Mo., 30-inch wheel, 7 feet head, displaced 40-inch "Leffel Special."

I. H. Detwiler & Co., Toledo, Ohio, 17½-inch wheel, 11 feet head, displaced 20 inch "Leffel" and gives double the power that wheel did.

A. G. Mowbray, Stockton, Minn, 20-inch wheel, drives entire mill.

Cotton, Dawell & Hamilton, Ottawa, Ills., 25-inch wheel, 26 feet head, drives entire mill.

Chas. Wells & Co., North Hatfield, Mass., 15-inch wheel, 26 feet head, drives entire mill.

Campbell & Son, Ashville, Ohio, 15-inch and 20-inch wheels, 11 ft. head, drive entire mill.

Niles Milling Co., Niles, Mich., 35-inch wheel, 9 feet head.

Wells & Dickey, Forrest Mills, Minn., 30-inch wheel, drives entire mill.

H. L. Wetherald & Son, Connersville, Ind., 20-inch and 15-inch wheel, 10 feet head, displaced Overshots.

S. C. Stewart, Tyrone Forge, Pa., three 20-inch wheels, 9 feet head.

Frame & Luccock, Kimbolton, Ohio, two 30-inch wheels, 6 feet head, drive entire mill.

Johnson, Perry & Co., Milford, Nebraska, 30-inch wheel, drives entire mill.

Wm. J. Bright & Co., Cooperstown, Pa., 17½-inch wheel, 8 feet head.

Hiram Walker, Valley City, Dakota, 25-inch wheel, 8 feet head, drives entire mill.

B. M. Dillenger, Green, Iowa, 25-inch wheel, drives entire mill.

George Schaaf, Westfield, Delaware County, Ohio, 25-inch wheel, drives entire mill.

Hyde & Hodges, Hokah, Minn., 35-inch wheel, 6 feet head.

White & Beynon, Lanesboro, Minn., 20-inch wheel, 26 feet head, displaced 30½-inch "Leffel" wheel, drives entire mill, with large increase of work over old wheel.

Kendall & Smith, Lincoln, Nebraska, 25-inch wheel, 13 feet head, drives "Woodlawn Mill," 125 barrels per day; 35-inch wheel, 10 feet head, drives "Capital Mill," 200 barrels per day.

J. H. White, Mitchell, Davidson County, Dakota, 35-inch wheel, 6 feet head, drives entire mill.

N. S. Gregg, Circleville, Ohio, 17½-inch wheel, in iron flume, drives entire mill.

Norton & Co., Lockport, Ills., 48-inch and 35-inch wheels, 18 feet head.

Cleaver & Collins, Caro, Mich., 20-inch wheel, drives entire mill.

Saxton & Thompson, Lockport, N. Y., 25-inch wheel, 25 feet head.

Thomas Jones, Columbus, Ohio, 40-inch wheel, 6 to 8 feet head, drives entire mill.

Lofthouse & Hammond, Boroughbridge, Yorkshire, England, two 35-inch wheels, 9 feet head, drive entire mill.

Mills & Houlton, Elk River, Minn., 35-inch wheel, 8 feet head.

Deffenbaugh, Lewis & Co., Wichita, Kansas, 40-inch wheel, 11 feet head, drives entire mill.

John R. Schall, Laury's, Pa., 35-inch wheel, drives entire mill.

F. B. Wilson, Fresno City, California, 30-inch wheel.

James D Smith, Elgin, Erie Co., Pa., 20-inch and 15-inch wheels, 8 feet head, drive entire mill.

Schroder & Trottman, Cedarburg, Wis., 20-inch wheel, drives entire mill.

Ritter & Horton, Palmyra, Wis., 25-inch wheel, 13 feet head, drives entire mill.

Amsden & Clark, Albion, Mich., 25-inch wheel, 8 feet head.

John Hall, Anderson, Ind., 17½, 20, and two 25-inch wheels, 6½ feet head.

T. S. Hayhurst, Waterloo, Wis., 25-inch wheel, 7 feet head, displaced "Brooks" wheel.

G. & L. D. Marsh, Valley City, Dakota, 25-inch wheel, 8 feet head, drives entire mill.

N. D. White & Son, Beaver Falls, Minn., 10-inch wheel, 29 feet head, drives entire mill.

H. & T. J. Walker, Fort Ransom, Dakota, 25-inch wheel, drives entire mill.

Jasper Lillie, Knoxville, Tenn., 17½-inch wheel.

Frank E. Herchenbach, Wausau, Wis., 40-inch wheel, drives entire mill, 6 to 8 feet head.

Samuel B. Croft, Covington, Ohio, 20-inch wheel, 25 feet head, drives entire mill.

Samuel H. Watson, Vinton, Iowa, 10 and 17½-inch wheels, 19 ft. head.

W. W. Stevens, Mayfield, Ga., 20-inch wheel, 9 feet head, displaced "Leffel" wheel.

Dr. Wm. Montgomery, Centerville, Hickman Connty, Tenn., 6-inch wheel, 45-feet head, drives grist mill complete.

M. H. Collins, East Medway, Mass., 35-inch wheel, 6 to 10 feet head, drives entire mill.

Paper Mills.

Union Paper Mfg. Co., Holyoke, Mass., 24 feet head, 35-inch wheel, displaced 45-inch "Bodine Jonval" wheel.

Vernon Bros. & Co., New York. Mills at Salmon Falls, near Westfield, Mass., 22 feet head, 48-inch wheel, displaced "American," and drives 12 large engines and one Jordan engine; also 20 and 15-inch wheels, driving calenders, and Fourdrinier machine.

Rochester Paper Co., Rochester, N. Y., 29 feet head, three 25-inch and one 35-inch wheels, driving engines, Jordans and Pulp machinery. Displaced "Leffel," "American," and "Tait Centennial" wheels.

Ohio Paper Co., Miamisburg, Ohio, 18 feet head, 35-inch wheel.

The Delaney & Munson Mfg. Co., Unionville, Conn., 16 feet head, 35-inch wheel, displaced 48-inch "Leffel" wheel.

Pultz & Walkley Co., Westfield, Mass., 9 feet head, two 20-inch and 30-inch wheels, displaced "Leffel" wheels.

Lockport Paper Co., Lockport, Ills.—straw board—48-inch, and two 15-inch wheels, 18 feet head.

Hoglen Bros. Pulp Co., Dayton, Ohio, two 35-inch wheels, 12 feet head.

John Robertson, Putney, Vermont, 8-inch wheel in iron flume, 32 feet head.

Frederick Burghart, West Stockbridge, Mass., Wood Pulp Mill, 25-inch wheel.

Ypsilanti Paper Co., Ypsilanti, Mich., 48-inch wheel, 16 feet head, displaced 66-inch "New American."

Sebago Wood Board Co., Portland, Maine, Pulp Mill, 25-inch wheel, 17 feet head.

Hart Lot Paper Co., Hart Lot, New York, 30-inch wheel, 21 feet head.

P. C. Baird, Lee, Mass., 12-inch wheel in iron flume, 30 feet head.

F. R. Lewis, Flint, Mich., straw wrapping, 44-inch wheel, 6 feet head.

Brownell & Miller, St. Charles, Ills., 30-inch wheel, 6 feet head.

Conneaut River Paper Mill, Conneaut, Ohio (manilla), 48-inch wheel, 9 feet head.

Dwight Paper Co., Marseilles, Ills., 48-inch wheel, 7 feet head, displaced 60-inch "American Wheel."

Valley Paper Co., Holyoke, Mass., 25-inch Wheel, 28 feet head.

Platner & Porter Mfg. Co., Unionville, Conn., fine paper, 20-inch wheel, 18 feet head, displaced "Houston" wheel.

Chas. H. Paul, Clinton, Conn., 17½-inch wheel in iron flume, 17 feet head.

Workmaster & Longknecht, Naples, Ontario County, N. Y., 10-inch wheel, 70 feet head, wood pulp mill.

Michigan Wood Pulp Co., Niles, Michigan, 30-inch wheel, 11 feet head.

Saw Mills.

Francis King, Feeding Hills, Mass., saw mill at Agawam, 17 feet head, 15-inch wheel, displaced 30-inch "Clark & Chapman" wheel.

Morton & Spellman, Williamsburg, Mass., 26 feet head, 12-inch wheel, Circular Saw Mill.

Truckee Lumber Co., Truckee, California, 35-inch wheel, Saw Mill, etc.

L. M. Weatherhead, Bernardston, Mass., 17½-inch wheel, 16 feet head, Circular Saw and Shingle Mill.

Pickett Bros., West Northfield, Mass., 15-inch wheel, 25 feet head, Circular Saw Mill.

J. A. C. Blackburn, War Eagle Mills, Arkansas, 35-inch wheel, 7 feet head, Circular Saw, etc.

M. V. Stow, Westfield, Mass., 15-inch wheel, 16 feet head, Circular Saw Mill.

Thos. W. Tucker, Tekonsha, Mich., 30-inch wheel, 7 feet head.

C. J. Shuttleworth, Springville, Erie Co., N. Y., 25-inch wheel, 12 feet head, Circular Saw Mill.

Miscellaneous.

Whetstone & Co., Cincinnati, Ohio, Linseed Oil Mill, 15 feet head, 25-inch wheel, displaced 40-inch "Kindlebarger" wheel.

Falls Rivet Co., Cuyahoga Falls, Ohio, 11 feet head, 25-inch wheel, displaced 35 inch "Leffel" wheel.

P. H. Standish, Chain Works, Cuyahoga Falls, O., 10 feet head, 20-inch wheel.

Falls Wire Mfg. Co., Cuyahoga Falls, O., 16 feet head, 25-inch wheel, displaced 30½ and 20-inch "Thos. Leffel" wheels.

Union Water Power Co., Unionville, Conn., 18 feet head, 25-inch wheel.

Pond & Hart, Mf'rs Hardware, Unionville, Conn., 18 feet head, 25-inch wheel.

Wm. R. Hartigan, Burlington, Conn., wood-working machinery, 21 feet head, 15-inch wheel, displaced 24-inch "Alcot" wheel.

E. J. Du Pont de Nemours & Co., Powder Works, Wilmington, Delaware, 18 feet head, 15-inch wheel, displaced Overshot.

Lacowsic Woolen Co., Hampden, Mass., 10 feet head, 20-inch wheel, displaced 36-inch "Clark & Chapman" wheel.

Isaac Ross, Thompson, Conn., Twine Factory, 12 feet head, 25-inch wheel, displaced 36-inch "Waldo Whitney" wheel.

Thresher & Co., Dayton, O., Varnish Manufacturers, 10-inch wheel, 9 feet head.

Niles Tool Works, Hamilton, Ohio, 26 feet head, 15-inch wheel displaced 25-inch "American" wheel.

Ames & Thayer, Cazenovia, N. Y., Sash, Door, and Blind Factory, 12 feet head, 30-inch wheel, displaced two wheels.

A. B. & C. D. Stuart, Otsego, Mich., Chair Factory, 7 feet head, 40-inch wheel.

L. J. Warner, Northampton, Mass., Silk Mill, 21 feet head, 6-inch wheel, displaced 10-inch "Leffel" wheel.

Merrick & Conant Mfg. Co., East Hampton, Conn., Silk Mill, 15-inch wheel, 20 feet head.

American Whip Co., Westfield, Mass., Whip Factory, 25-inch wheel, 5 feet head.

New High Shoals Mfg. Co., High Shoals, Ga., Cotton Factory, 48-inch wheel, 9 feet head, drives entire factory.

Miami Powder Co., Xenia, Ohio, 15-inch wheel, 9 feet head, displaced Overshot.

Wiley & Russel Mfg. Co., Greenfield, Mass., 20-inch wheel, 14 ft. head.

J. W. King Powder Co., Xenia, Ohio, 25-inch wheel, 8 feet head.

Geo. H. Mansfield & Co., Canton, Mass., Thread Mill, 25-inch wheel.

Beven Bros. Mfg. Co., East Hampton, Conn., Mf'rs Bells, 8-inch wheels.

Houghton & Allton, Putnum, Conn., Cotton Factory, 17½-inch wheel, displaced "Leffel" 26½ inch.

Wm. Willcut, Plainfield, Mass., Handle Factory, 15-inch wheel, 16 feet head.

C. S. Shattuck, Hatfield, Mass., Mf'gr Pistols, 12-inch wheel 26 ft. head.

Hills Bros., Williamsburg, Mass., Mf'rs Buttons, etc., 20 and 15-inch wheels, 26 feet head.

The Ottawa Tile Co., Ottawa, Ills., 20-inch wheel, 21 feet head.

Rogers & Spurr Mfg. Co., Greenfield, Mass., Mf'rs Plated Ware, 6-inch wheel in iron flume, 26 feet head.

J. S. Graham & Co., Rochester, N. Y., Mf'rs Machinery, 8-inch wheel in iron flume, 73 feet head.

W. H. Gorsline, Rochester, N. Y., rents room and power, 15-inch 12-inch wheels in iron flumes under 84 feet head.

A. Schotsman Aine & Co., Don, France, 25-inch wheel, 6 feet head.

Clemson & Co., Boston, Mass., Factory at Montville, 15-inch wheel, displaced "Leffel 23-inch Special."

Illinois Starch Co., Ottawa, Ill., 15, two 20, 25 and 30-inch wheels, 26 feet head.

Mill River Button Co., Leeds, Mass., 30-inch wheel, 12 feet head.

O. H. Smith, Carpentersville, Ills., 48-inch wheel, 7 feet head, Planing Mills, etc., displaced "Leffel" wheel.

H. A. Weldy & Co., Tamaqua, Pa., Powder Mf'rs, 25-inch wheel.

Greenville Mfg. Co., Florence, Mass., Cotton Factory, two 17½-wheels in iron flumes, 27 feet head, displaced two 30½-inch "Leffel" wheels.

Ravine Mills Co., Vernon Depot, Conn., Cotton Factory, 17½-inch wheel, 20 feet head, displaced "National" wheel.

A. W. Dewey, Westfield, Mass, 15-inch wheel, 13 feet head.

Its enormous capacity in a small diameter, high percentage of useful effect, simple, strong construction, and perfect gate, give to the VICTOR TURBINE a combination of excellencies not found in any other wheel.

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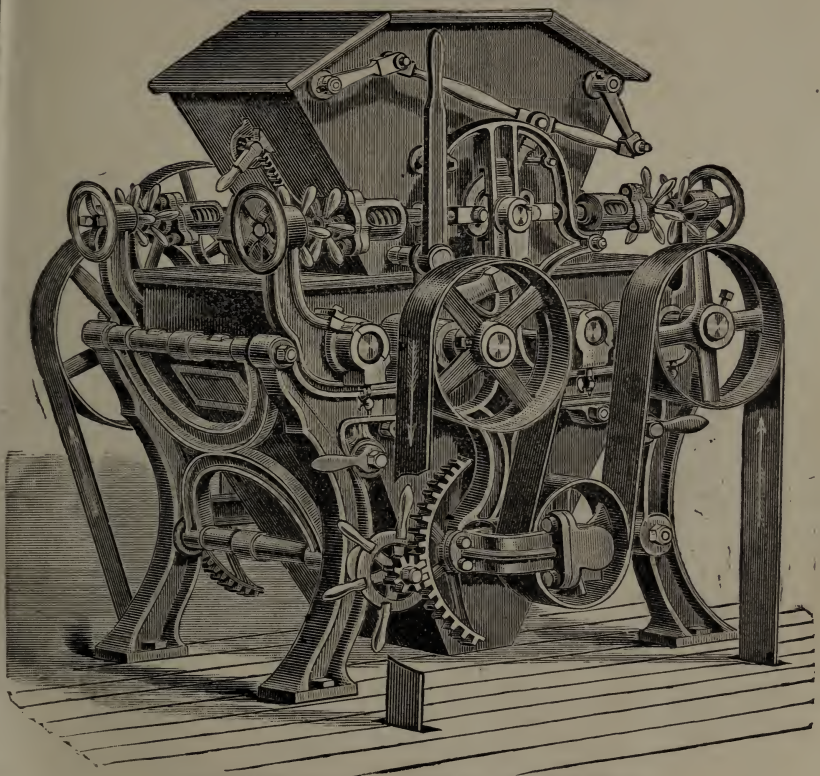

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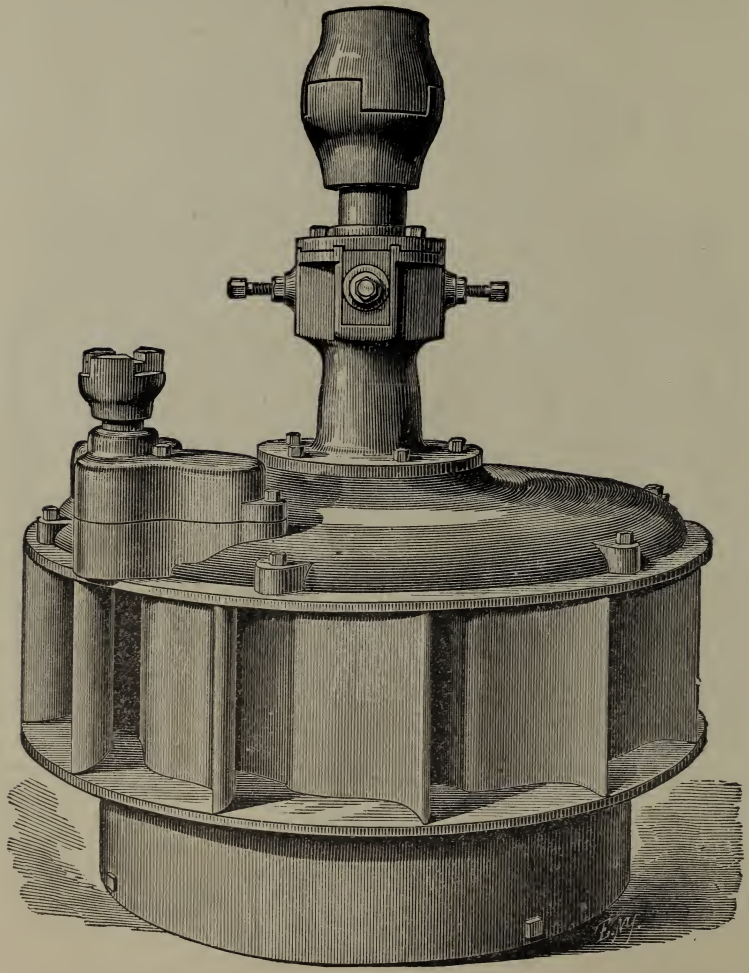

THE ECLIPSE DOUBLE TURBINE.

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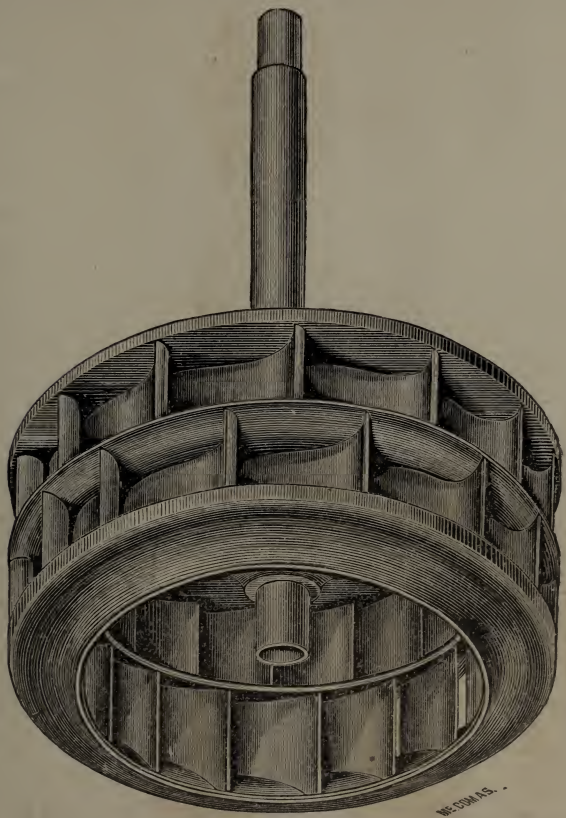

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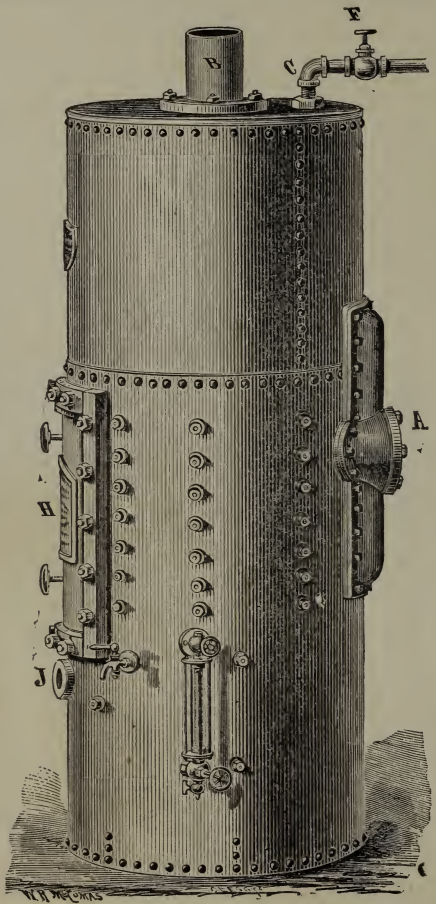

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